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ABSTRACT

Seven papers from the 1988 CAUSE conference's Track VI, Outstanding Applications, are presented. They include: "Designing DB2 Data Bases Using Entity-Relationship Modeling: A Case Study--The LSU System Worker's Compensation Project" (Cynthia M. Hadden and Sara G. Zimmerman); "Integrating Information Technology: Prerequisites for Success" (Kenneth Blythe and Steven Watson); "An Implementation Strategy for Cooperative Computing and Campus Connectivity" (Anthony S. Halaris and Lynda W. Sloan); "Rensselaer Libraries Online Information System" (Barbara A. Lockett); "The UWSP M-System: Tools and a Turnkey System for a Complete Academic Network Operating Environment" (Daniel V. Goulet, Andrew C. Moody, and Bruce Staal); "CCNews: An Electronic Newsletter and Articles Database" (Daniel A. Updegrove, Sheldon B. Smith, and Wendy Rickard Bollentin); and "Innovative Approaches to Integrating New Technologies with Matriculation Efforts Using Smart Card Technology" (David J. Bell and George Bjarke). (SM)

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# *Information Technology: Making It All Fit*

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# Track VI
## Outstanding Applications

*Coordinator:*
*Milly Koss*
*Harvard University*

Several outstanding applications have resulted from successful integration of information technologies. Papers about these applications show what some institutions are doing in the development, implementation, and operation of information resources.

*Daniel V. Goulet,*
*University of Wisconsin/Stevens Point*

*Steve R. Watson,*
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*Rensselaer Polytechnic University*

# Designing DB2 Data Bases Using Entity-Relationship Modeling
## A Case Study - The LSU System Worker's Compensation Project

**Cynthia M. Hadden and Sara G. Zimmerman**
**Louisiana State University**
**Baton Rouge**
**Louisiana**

The Entity-Relationship approach to data base design, a state-of-the-art design methodology, has become the accepted design methodology at LSU. Using this design methodology, new systems are being implemented much faster with less conflict between Data Base Administration, Development Analysts, and Users. The LSU Worker's Compensation data base was one of two pilot data bases designed using Entity-Relationship Modeling techniques and implemented in DB2. An account of this project, the design methodology, and considerations which should be given when implementing the design in DB2 are presented.

# Designing DB2 Data Bases Using Enitity-Relationship Modeling: A Case Study - The LSU System Worker's Compensation Project

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The LSU System Worker's compensation project was one of two pilot projects at LSU which were designed using Entity Relationship modeling and implemented in DB2. The Entity-Relationship approach to data base design which was used in the Worker's Compensation project has become the accepted data base design methodology at LSU. This methodology has eliminated the confusion previously associated with data base design and has led to a reduction in application development time.

The LSU System Worker's Compensation project was chosen as a DB2 pilot project for two major reasons. The Worker's Compensation system is small and has a small number of users. Also, there were no high pressure demands or deadlines put on the project because there was an existing PC system in place.

This paper is an account of this pilot project, the design methodology used and the considerations which were given or should be given to DB2 data bases. Part I contains overviews of data base design at LSU, the LSU DB2 environment and the Worker's Compensation pilot project which is the subject of the case study. In Part II, data base design using Entity-Relationship modeling is examined.

## I. BACKGROUND

### Data Base Design History

Several years prior to the Worker's Compensation project, standards for application development at LSU were established. These application standards included five phases of development: requirements definition, external design, internal design, program development, and system implementation. These development standards had been proven to be successful. However, at the time the Worker's Compensation project was initiated, there were still no guidelines for data base design. Data base design was done almost as an afterthought between the external and internal design phases of the project. Also, due to a major reorganization of the computer center and rather high turnover, the data base administration team was relatively new and inexperienced; the senior analyst on the team had about three years experience in the data base area. Needless to say, data base design was a source of much confusion and friction.

Prior to the Worker's Compensation project, the initial data base structure was often proposed by the project leader. The project leader would have most likely arrived at the proposed data base by grouping elements into segments and segments into data bases. In other words, the project leader would have used a "bottom up" approach. Typically, segments and data bases were grouped not by any relationships between the data but by how the data was to be displayed on screens identified in the external design phase of the project. A data base designed this way would often last only as long as the end-user's business processes remained the same.

The proposed data base structure was submitted to data base administration. The DBA analyst, knowing little or nothing about the project, would review the data base design. The review often resulted in the DBA analyst unnecessarily investigating every data element proposed in the new data base. The DBA analyst would make recommendations on indexes, logical relationships, etc... Sometimes, however, the analysis of the data would lead the DBA analyst to propose a new data base design; the new design was often based on the instinct of the DBA analyst.

The result, of course, was conflict between the DBA analyst and the project leader. This usually painful conflict prolonged the application development time. A rift began to develop between the data base administration and application development groups.

In the fall of 1985, two DBA analysts attended an IBM class entitled Data Base Administration and Design. In this class, the Entity-Relationship approach to data base design was introduced. As it turned out, Dr. Peter Chen, a professor at LSU, had proposed the methodology. Although at that time there was no contact with Professor Chen, a copy of his monograph "The Entity-Relationship Approach to Logical Data Base Design" became a valuable tool in data base design at LSU. The Worker's Compensation data base presented here was one of the first data bases designed at LSU using the Entity-Relationship (E-R) approach. The E-R approach works hand in hand with the application standards already in existence. The friction between project leaders and DBA analysts has been eliminated and application development time has been reduced. Since Worker's Compensation, all new data bases at LSU have been designed using this approach.

Database 2

Although Release 1 of DB2 was installed at LSU in December, 1985, it was not really available until mid-to-late sumer 1986. Even at the time it became available, everything was not in place for application development. Some of the problems were DB2 related; some were due to the inexperience of the DB2 system programmers; and others were caused by general constraints on a heavily used CPU.

One of the earliest problems was Common Service Area (CSA) constraint. CSA limitations were so severe that the test IMS system could not be brought up during regular work hours. DB2 required, however, that application programs be tested under a test IMS system. Unfortunately, the time constraints on the two DB2/IMS pilot projects required that coding and testing be done before the situation could be corrected. This meant that DB2/IMS applications had to be tested early mornings, nights and weekends.

Things improved over time, however. New releases of other IBM products that provided CSA constraint relief were installed. In the fall of 1986, only one application program could be tested at one time. At Christmas, DB2 Release 2 was installed and test IMS was being brought up all day. Just about the time the Worker's Compensation System was transferred to production in the spring of 1987, there were full test and production DB2 environments. At the time of this writing, there are fifteen data bases in production and eleven new data bases in development. An additional DB2 system has been implemented in an ISPF/QMF environment.

System Worker's Compensation Project

The LSU System Worker's Compensation (SWC) office handles documents related to injuries and illnesses that occur while an individual is employed on an LSU campus. The SWC office handles approximately 2000 new injuries per year along with many associated forms and documents. This office is responsible for injuries that occur on ten campuses, located state-wide, and approximately four outside agencies, the most important being the State Office of Worker's Compensation and the independent insurance company which handles the worker's compensation claims. An injury report, which is filled out by the campus personnel office, initiates the involvement of the SWC office. From this point on, all forms and inquires generated as a result of that injury will relate to the injury report.

There were numerous requirements for the new system. The primary system objectives were to:

- provide an easier, more efficient manner of gathering all data associated with an injury report;
- provide a distributed method for capturing the data from the campuses and then departments within the campuses;

- provide a centralized location of all data to improve reporting capabilities;
- allow for multiple injuries per employee and associate incoming documents with the correct injury;
- track medical bills, payments, checks and settlements;
- insure that the injuries were reported to the State Office of Worker's Compensation within the legally defined number of days to prevent fines set at $100.00 per late notice.

## II. ENTITY RELATIONSHIP MODELING

The Entity-Relationship (E-R) approach to data base design is a three phase process in which a model of a business in translated into a physical data base mapping. The three models which are used include:

1. Entity-Relationship Model
2. Conceptual Data Model
3. Physical Data Base Model

The Entity-Relationship Model (ERM) is a model of a business. The Entity-Relationship Model is a model of what a business is about and not how the business carries out its operations. The ERM is the cornerstone of the whole Entity-Relationship modeling process. The Conceptual Data Model (CDM) is a plan for storing the data of a business based on the model of the business. Finally, the Physical Data Base model is a mapping of how the data will be stored in a particular data base management system such as IMS or DB2. It is important to note that the physical data base management system is not even discussed until the development of the physical data base model. In the remainder of this text, each of these models will be discussed in more detail and the evolution of the Worker's Compensation data base will be described.

### The Entity-Relationship Model

The Entity-Relationship Model (ERM) is a model of the business itself. This model is developed in two steps. The first step is to define the business entities; the second step is to identify the relationship between those entities.

The first step in defining the ERM is to identify the business entities. A business entity is a person, thing, or concept which has significant lasting value to the business. Examples of the business entities of a university would include students, courses, and employees. All three of these entities are crucial to the running of a university. Eliminating any one of these entities would change the nature of the business; it would no longer be a university. If the student entity were left out, for example, the business would no longer be a university.

### Case Study

Six business entities were identified in the Worker's Compensation system:

a. Injured - the person who had the injury.
b. Injury Report - the Worker's Compensation record of an accident.
c. Insurer - the insurance agency currently handling all claims.
d. Claim - the claim filed with the insurance company.
e. Bill - bills incurred by the injured because of the accident.
f. Draft - checks issued by the insurance company for payment of medical bills, worker's compensation, and settlements.

Note that business entities are identified and not data about the business entities. In defining Injured as a business entity, the focus is on the fact that an injured person exists and not on the information about a person.

Once the business entities have been identified, the relationships between the entities are defined. The nature of the relationships is also identified; that is, whether or not the relationship is one-to-one, one-to-many, or many-to-many.

Case Study

In the Worker's compensation system, eight relationships between the six different business entities were identified. The order in which the relationships are presented has no significance.

1. The Worker's Compensation office contracts with an Insurance Agency to handle Worker's Compensation Claims.
   (One INSURER handles many CLAIMS.)
2. An injured person files an injury report with the SWC office.
   (One INJURED may file many INJURY REPORTS.)
3. The injury report is filed as a claim with the insurance agency.
   (One INJURY REPORT is assigned one CLAIM.)
4. The injured person may incur bills as a result of a specific injury. The bills may be incurred
&5. before a claim has been filed with the insurance agency or after the claim is filed.
   (One INJURY REPORT incurs many BILLS.)
   (One CLAIM incurs many BILLS).
6. Drafts may be made on bills incurred as a result of the injury.
   (Many DRAFTS pay many bills.)
7. Drafts may be made as a result of compensation and settlements.
   (Many DRAFTS pay compensation for one CLAIM.)
8. The injured person may receive the drafts.
   (Many DRAFTS are paid to one INJURED.)

According to the IBM Data Base Design and Administration class and Dr. Chen's monograph, entities are shown diagrammatically in boxes and the relationships between entities are shown in diamonds.

Case Study

The SWC Entity-Relationship Model is shown in Figure 1.

The Entity-Relationship model, independent of its use in data base design, is a very valuable tool. It is a succinct representation of the business being modeled. As such it is a great communication tool for discussion about that business, facilitating understanding between system design personnel and the personnel who will ultimately use the system.

The Conceptual Data Model

Once the ERM is identified, logical data base design, is attempted. The model used is the Conceptual Data Model. The Conceptual Data Model is a strategy for storing the data of a business based on the model of the business (ERM). The Conceptual Data Model addresses issues concerning where particular pieces of data will be stored. For instance, in the example relating to university entities, will grades be stored with information about the student or information about the class?

In the Entity-Relationship Model, emphasis was placed on the business entity itself; in the Conceptual Data Model, the focus is on the data associated with the entity. As stated earlier, student is a business entity for a university. In the Conceptual Data Model, the student data entity would contain the student's name, address, age, etc... It is important to note however that physical implementation of the data base (that is, whether the data bases involved will be DB2 or IMS) is still not discussed.

**SYSTEM WORKER'S COMPENSATION**
**ENTITY RELATIONSHIP MODEL**

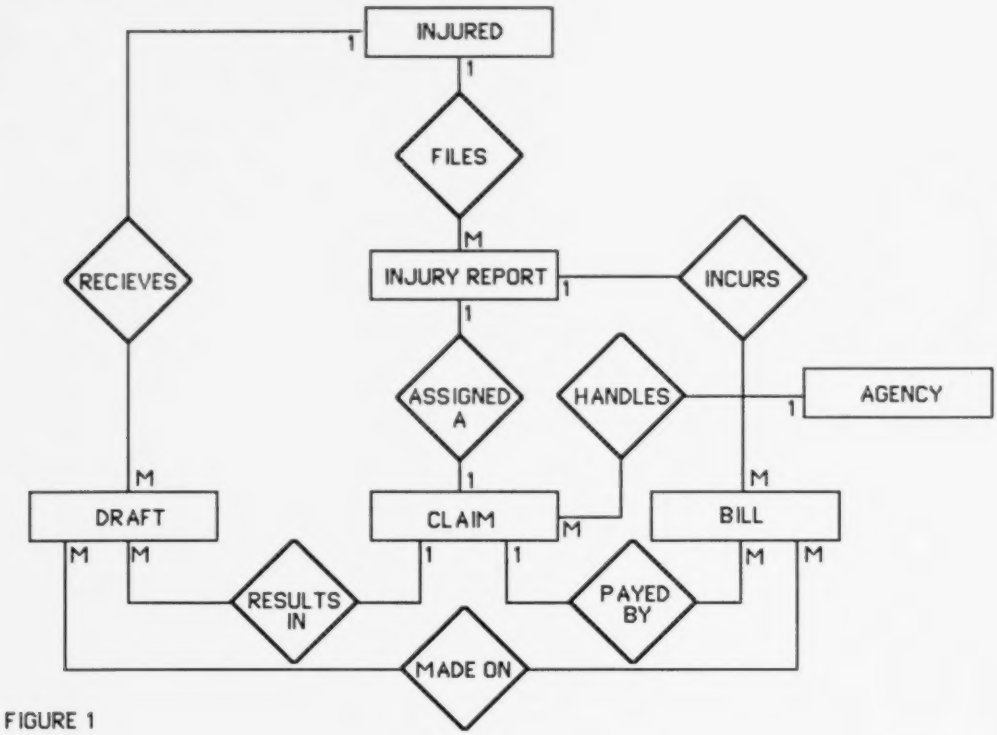
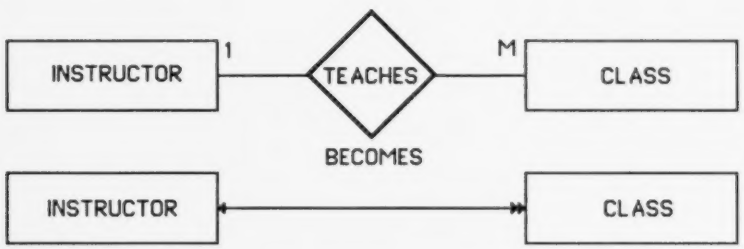



FIGURE 1

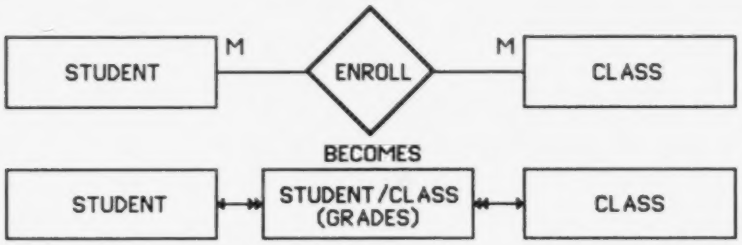
The Entity-Relationship Model is converted to a Conceptual Data Model (CDM) using very simple rules:

1. All business entities become data entities (kernels).
   Kernels are those data entities which capture information on the business entities identified in the ERM. In our university example, the student data entity captures information about the student business entity.
2. All one-to-one and one-to-many relationships remain intact.
   However, the diamonds are replaced with single lines having arrows at both ends. A double-headed arrow indicates the "many" side of the relationship; a single-headed arrow indicates the "one" side.



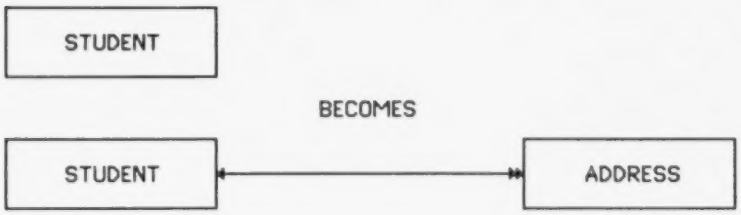
3. Each many-to-many relationship is converted into two one-to-many relationships and the intersection information becomes a data entity (associations).

   Associations are those data entities which capture information about relationships between business entities. Association entities are generally only needed when the relationships between business entities are of the many-to-many variety. Again, referring to the university example, association entities address questions such as where grades will be stored.




4. Repeating data is pulled out to form additional data entities (characteristics).

   Characteristics are information on a business entity captured repeatedly (repeating groups). In a university setting, if several different addresses are going to be stored for each student (home address, campus address, mailing address, etc...), then student address becomes a data entity.




Case Study

In the Worker's Compensation system, six kernels, one association and two characteristics were identified.

a. Injured (Kernel) - specific static information on the employee who was injured.

b. Injury (Kernel) - information related to the injury itself along with certain information about the injured at the time of the accident. This information was needed to report to the insurance company since these factors might figure in, in case of a law suit.

c. Claim (Kernel) - injury report information as sent to the insurance company. The claim and the injury report go hand-in-hand with one exception; the claim has a unique number assigned by the insurance company associated with it. This number, known as the file number, is not available at the time the injury report is entered into the system; it becomes available at some later date after the insurance company has received the injury report and issued a number for it. Once the file number is known, all correspondence between the insurance company and the SWC office relate to this number.

d. Bill (Kernel) - data on bills incurred by the injured as a result of an accident. Keep in mind an employee can have concurrent medical treatment for two separate injuries and the bills must be assigned to the right injury report. Also, bills may be received before the insurance company issues a file number.

e. Draft (Kernel) - data on the check issued by the insurance company for payment of medical bills, worker's compensation, lump sum settlements, etc.. If it is payment on a bill, it must be associated with that bill. A draft can also be payment on more than one bill.

f. Agency (Kernel - address data for agencies the system corresponds with in relation to an injury.

g. Bill/Draft (Association) - data about bills paid by drafts and how much of each bill was paid.

h. Claim Status Changes (Characteristic) - data on the status of a worker's compensation claim at different phases in the processing of a claim.

i. Lost Time (Characteristic) - a record on work hours lost due to an injury.

The SWC Conceptual Data Model is shown in Figure 2.

**SYSTEM WORKER'S COMPENSATION**
**CONCEPTUAL DATA MODEL**

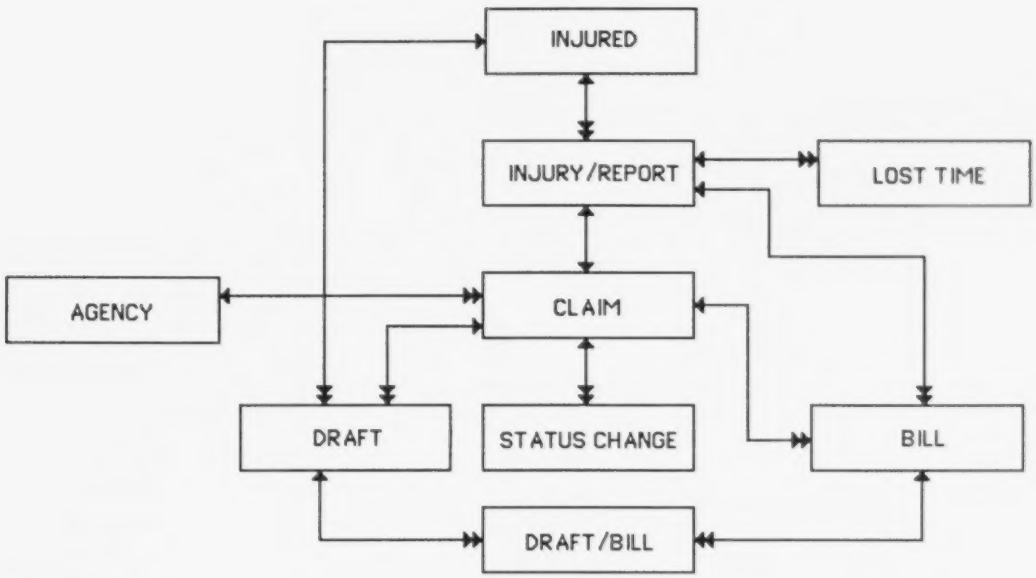



FIGURE 2

Once the data entities are enumerated, the data model is then populated.

First, the key to each entity is defined. The key is the unique value by which a set of data in the data entity is identified. For example, SSN might be a key of the Employee data entity.

Keys of kernels should be unique values which identify a particular set of data. Class Number, for example, might be a key to a Class table. The key to an association is usually a composite of the keys of the two kernels related through the association. The key to a Student-Class table which contains

grades, rank, etc... would be a combination of the student's SSN and the Class Number. The key to characteristic is usually the key of its parent plus some unique number or code. For example, SSN and Address Code might be the key of the Student Address table.

Once all keys have been identified, relationships are implemented by storing the key of a data entity on one side of the relationship in the data entity on the other side of the relationship. For example, to relate the instructor entity to the class entity, the key of instructor is stored in the class entity. Instructor would be a foreign key of the Class entity. The general rule of thumb is that the key of the entity on the "one" side of the relationship is stored in the entity on the "many" side of the relationship.

Case Study - Keys and Foreign Keys

The SWC Tables, Keys and Foreign Keys are listed in Figure 3.

**SYSTEM WORKER'S COMPENSATION**
**TABLES, KEYS AND FOREIGN KEYS**

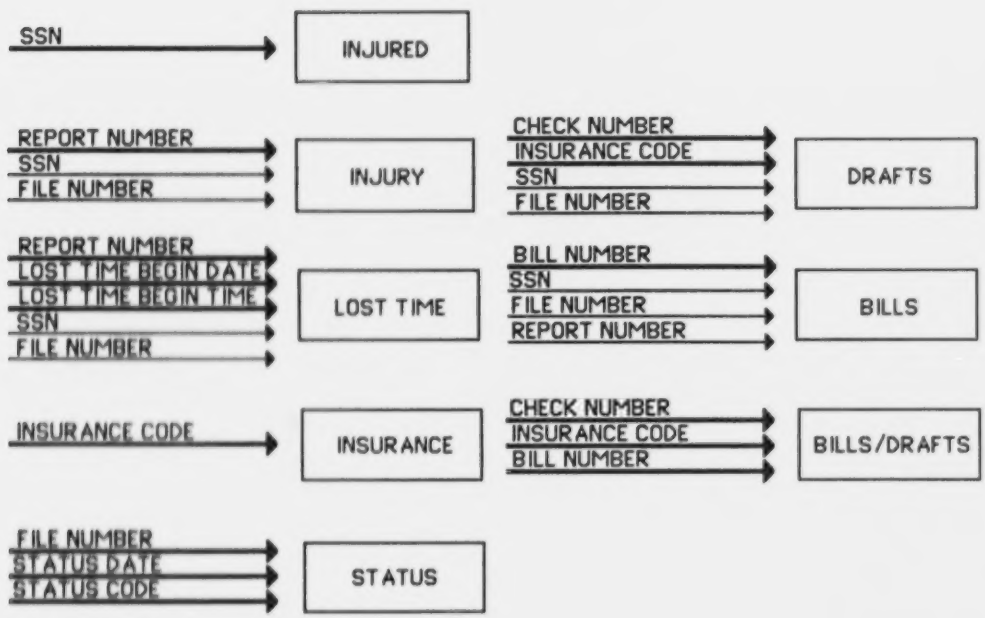



FIGURE 3

Once the keys and foreign keys have been identified, the project leader working in conjunction with his clients populates the data entities with non-key data. In populating the data entities, more characteristic data entities may be defined.

The Physical Data Base Model

The Physical Data Base is a model of how the data will physically be stored. It is at this point in the design that decisions on the data base type (IMS, DB2, etc...) and access methods are made. Work on the physical data base model can begin as soon as the conceptual data model is defined, even before it is populated.

In general, it is much easier to come up with a physical data base model in DB2 than it is in IMS. DB2 is a relational data base management system. A relational data base management system is one in which the data is perceived to be stored in tables.

Three considerations for implementing a data base in DB2 are tables, indexes, and data types.

1. Tables

   Each data entity in the Conceptual Data Model usually becomes a DB2 table. However, if two data entities are related in a one-to-one manner and one of the data entities is always created at the same time or after the other data entity, the two data entities can be stored in the same table without any loss of integrity or gain in redundancy.

   Case Study

   The following eight tables were defined in the SWC system:
   Injured, Injury, Lost Time, Status, Bill, Draft, Bill/Draft, Insurer

2. Indexes

   Indexes should be created on each key and foreign key identified in the Conceptual Data Model. In DB2, this is the minimum number of indexes that will be needed. Also, at this point, referential integrity rules should be established.

   Case Study

   At first, it seemed rather silly to put an index on some of the smaller SWC tables which were only a few tracks in size. The overhead for a DB2 index is rather high; for some of these tables the index would have been the same size as the table. However, when the system was transferred to production, there were some response time problems. Adding indexes dramatically improved performance. As a result, the decision was made to sacrifice disk storage space for performance. In the Worker's Compensation system, there are now seventeen indexes on the eight different tables.

3. Data Types

   In selecting the data type of each field in a DB2 table, one must consider the fact that the table will be used not only in a transaction driven environment but in an adhoc query environment as well. Character data is often easier to work with in programs but adhoc users cannot use arithmetic functions such as SUM and AVG on character data.

   Case Study

   An example of restrictions involving data types that had to be re-evaluated in the SWC system were date fields. These fields were stored as character and moved to numeric fields in the programs to compute the number of days between dates. This computed field was not stored. Later, when the users started writing their own adhoc queries, computing this field was not possible since the data types of the components were character. This restriction resulted in adding a new field to the table and storing the computed days for reference in adhoc queries. It should be noted that the Worker's Compensation data base was implemented before the date data type became available.

Once a DB2 data base design is firm and the tables populated, it usually takes less than a day at LSU to create the test data base and have it ready for use.

## III. SUMMARY

It is important in developing and implementing new computer solutions to remember that the resource is actually the data. All the programs, reports, screens etc... are access paths to the resource (very important access paths but access paths nonetheless). Changing programs may sometimes be expensive and involved but changing data bases almost always is. Therefore, it is important when designing new computer systems to start with the resource - the data base. At LSU the importance of data base design has been recognized by moving it to the forefront of system design. Data base design is now done by moving the data base design to the requirements definition and external design phases of a project.

The Entity-Relationship approach to data base design is one method of designing data bases. The primary advantage of Entity-Relationship modeling is that it models what a business is about and not how the business functions. Therefore, data bases designed using the E-R approach should be more lasting and stable than data bases designed using other techniques.

What gives Entity-Relationship modeling its strength, however, is also what makes it rather difficult. Analysts who have worked on projects for a long time sometimes have trouble identifying the business entities. The problem is that, typically, analysts tend to ask and answer How: "How will claims be filed? How will drafts be paid?". In asking How?, the analyst gets wrapped up in policies and procedures that change over a period of time. Entity-Relationship modeling asks What: "What is a claim? What is the relationship between a claim and a draft?". The answer to WHAT? is the more stable and lasting part of the business. Thus, data bases designed through Entity-Relationship modeling should be more durable.

Another difficult thing about the E-R approach to data base design is that there is no correct answer. Generally, the best answer or model is the one that is most obvious; it is the model about which you say (after days or weeks of modeling the business) "Why didn't I come up with this in the first place?". At LSU, the modeling team works best when it is composed of representatives of the project team, the database team and possibly the user community. This works best because the project leader and clients contribute their knowledge of the business while the data base people contribute their objectivity and modeling experience. The Entity-Relationship approach to data base design which was presented here has become the accepted data base design methodology at LSU. Without the E-R approach, it would not be possible to have the number of data bases in development that now exist. It has eliminated much friction and led to a reduction in application development time.

Obviously, this presentation is just an overview; many interesting points and exceptions have been omitted. Either Professor Chen's monograph or the IBM Data Base Administration and Design class should be consulted for more complete details. The authors do hope, however, that this account of the Worker's Compensation Pilot Project will give you insight into the DB2 data base and application design process.

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# INTEGRATING INFORMATION TECHNOLOGY
## Prerequisites for Success

by Kenneth Blythe
Steven Watson

This paper describes the progress of two land grant Universities, Washington State University (WSU) and Penn State University (PSU,) in integrating information technology. WSU is nationally recognized for its use of data administration, CASE and software productivity tools. Both universities are administering heterogeneous computing environments involving IBM and Digital computing systems. Integrating this diversity requires new planning, new management and new financing techniques. Plans for integrated technology must be in keeping with the Universitywide business plan. Users play a much larger role in this strategy. Computing technology is being moved into the "culture" of the Universities with the acceptance of "data" as an institutional asset.

# INTEGRATING INFORMATION TECHNOLOGY
## Prerequisites for Success

*by Kenneth C. Blythe and*
*Steve R. Watson*

"If the word "excellence" is to be applicable in the future it requires wholesale redefinition. Perhaps: Excellent firms don't believe in excellence - only in constant improvement and constant change. That is, excellent firms of tomorrow will cherish impermanence - and thrive on chaos."

Tom Peters ***Thriving on Chaos***

Now it's the "baby busters." Just as we were growing comfortable with the surging population boom of post-war babies, we are faced with the scarcity of post-post-war babies; the so-called baby busters. In the next decade, workers will be a diminishing portion of the population. Those that work will demand better working conditions and better pay. Our nation will only remain competitive through improved productivity. Productivity will replace unemployment as our number one economic priority. Workers will produce more. They will know more and expand their knowledge throughout their careers. Job mix will change. There will be more knowledge workers and less factory workers. Careers will change frequently. The decade will be marked by rapid technological and societal transformations.

To keep up, workers will be in a continuous state of learning. Learning will not stop at age twenty-two. It will continue for life. Nontraditional, lifelong learning and retraining will be the norm. Higher education will respond by offering career-oriented education in nontraditional settings. The traditional, degree-seeking, high school pool will decline in favor of a new pool of nontraditional place-bound adult learners. Students will be served by invisible offices, invisible faculty in invisible classrooms.

Higher education will not be able to avoid similar technological and instructional transformations. As Tom Peters explains, in his latest book ***Thriving on Chaos***, "If you are not reconfiguring your organization to become a fast-changing, high-value-adding creator of niche markets, you are simply out of step." Higher education will change. Technology, a peripheral concern in many institutions today, will move into the mainstream. Technology is both a field of instruction and a means of instruction. And it will certainly transform the administration of instruction. Never before has higher education been challenged to alter itself to the extent that it will be challenged in the next decade.

These are exciting times! As described by John Nesbett in his book ***Megatrends*** there are "ten major transformations taking place right now in our society. None is more subtle, yet more explosive, I think, than this first, the megashift from an industrial to an information society." We witness the birth of the information age. But, are we ready? Are we learning or merely observing the transition? Are we seeking new methods of instruction? Are we preparing ourselves for the changes that will surely come? At Washington State University (WSU) and Penn State University (PSU,) we are asking ourselves these questions. This is a report on the things that are underway at WSU and PSU which are preparing us for the next decade. This is a report of our attempts to integrate information technologies on our campuses.

## *ARCHITECTURE*

Architecture is overused and often misunderstood. It is a symbolic word. It means that success in technology requires a vision; a carefully integrated plan. Like the architecture of a house, the architecture of an information system is integrated, efficient and functional. The pieces fit together nonredundantly. Architecture is contrasted to collage which is an assembly of diverse elements. Information systems that just "happen," without a plan, become a collage. Implicit in the word architecture is an intellectual process which anticipates future events and provides a framework within which those events will occur.

At WSU and PSU there is an information architecture. We are implementing technology on a changing field of play. The solutions that work today could be inhibiting in the future. Our integrated architecture is not a vision of where we are but where we are going. The vision is, of course, speculative, but there seems to be evidence that technology will tend toward greater homogeneity in the future. Information systems will be built around multiples of computer and communication machines provided by multiples of vendors. Standards organizations and vendors alike are providing products which are interoperable. This will increase in the future. To live in this future world, it is going to be important to have an architecture that surrounds this homogeneous environment. These are the key elements of the integrated information systems that will be implemented at WSU and PSU:

- Cooperative Processing - PSU and WSU are both multicampus institutions. PSU has twenty-two campuses and WSU has seven. An architecture is required to provide computing services at the central, distributed and local levels and at the same time preserve the integrated whole. WSU has already implemented a common signon which provides a single system image regardless of which processor is being used. Cooperative processing is with us and will continue to evolve. There are already more MIPS of computing available at the local level (micro and minicomputers) than at the central levels (mainframes). Central computers will become

information utilities with local processors handling the majority of the transaction processing cycles.

- Common Software Architecture - The glue which holds a distributed architecture together is software. How do you achieve a common user interface? With software. How do you distribute databases? With software. How do you provide end-user services? With software. PSU and WSU develop their administrative computing systems with the Software AG database and fourth generation language. The Software AG architecture, known as the Integrated Software Architecture (ISA,) has the benefit that it runs in a heterogeneous hardware environment with multiple operating systems. ISA provides distributed processing support for cooperative processing.

- Merging Academic and Administrative Computing - The business of higher education is academic. The functions of academic and administrative computing are different only in implementation. Early administrative computing applications were standalone as were early academic applications, but no longer. As the scope of computing expands and the goals grow more complex, it becomes necessary to draw the two computing disciplines together. Testing, counseling, advising, assessing, instructing and grading all have an administrative and academic dimension. In recognition that these two disciplines are merging, both WSU and PSU have joined academic and administrative computing (along with telecommunications) under a single university officer. The next step is to more closely associate the missions of these two computing activities. If administrative computing is to participate in the evolution of nontraditional modes of instruction, it will be by participating in the process of instruction itself.

- Data Administration - Data is an asset but its value is transient. It is useful for the moment that it is needed then its usefulness diminishes until it is needed again. Just-in-time information is as vital to higher education as just-in-time inventory is to automobile manufacturing. Data administration insures that useful (accurate, timely, secure) information is available at the time that it is needed in a form that can be used. In these days of cooperative processing, networking and software architectures, it is essential to have a strong data administration program. Data administration provides consistent business practices which facilitate smooth business operation.

- Computer Aided Software Engineering (CASE) - There is finally the question of quality and productivity. It seems that computing has been successful at improving the productivity of all disciplines other than computing itself. We are speaking here of software productivity. You would think that solutions in this area would be apparent, but they are

not. Washington State University and Penn State University are working with the Software AG fourth generation language NATURAL and the results are promising. Programmer productivity has definitely been improved, perhaps by a factor of ten. But, improvements in programmer productivity could be more than offset by the slowness of the front-end activities of conceptualization and systems design. Improvements here are based upon a new reality that end-users must become more involved in the design process. As Greg Boone, President of CASE Research Corporation observed, WSU has "made a discovery, which is quite contrary to established beliefs in our industry. They have found end-users quite capable of learning both analysis techniques and the use of CASE tools to support those techniques." At PSU and WSU, CASE tools are becoming the common denominator of communications; they assist in the design process. Soon, the results of these tools will be used to generate NATURAL programs from design statements.

These diverse parts of the technology puzzle do not simply fall into place. Leadership is required. The pieces must be installed one by one. No one can afford to pursue all pieces at once. Nor can they afford to ignore any piece. The sooner there is a recognition that an architecture is required, the sooner the institution will begin making progress toward integrating information technology.

## LEADERSHIP

The transition to the information age is happening. The question is, who is in charge? Who is leading? Is anyone? Managers of Information Systems (I/S) have a special obligation, these days, to stay current in their field and fashion creative programs for bringing technology to their institutions. With limited resources, they must use their imagination to finance those programs that provide the greatest payoff.

I/S managers must know how to use I/S to compete. They must have vision and an architecture which implements that vision. Father Theodore Hesburgh, former Notre Dame University president, explained that "The very essence of leadership is that you have a vision. It's got to be a vision you articulate clearly and forcefully on every occasion. You can't blow an uncertain trumpet." (***Time, May 1987***) Information Systems (computers, software and communications) enhance the image of institutions and help them recruit and retain gifted students, faculty and staff. Information Systems also help to bring in research dollars and other revenues. Without up-to-date research tools (i.e., computers), it is not possible to compete effectively in the research marketplace.

Information systems undergird the administration of modern institutions and simultaneously streamline and enforce the way we do business. This is an advantage and also a disadvantage. On the plus side, information systems allow a university to use its limited staff resources more effectively. Large Universities such

as WSU and PSU could not function without technology to handle many of the routine administrative tasks. But, on the negative side, I/S can also become an inhibitor of change. For example, changes in academic calendars (from quarter to semester) are impeded if the information systems are based on a quarterly calendar. The information systems are actually a hindrance in this case. As long as you do things the same, I/S has been effective. In the future, it will be necessary for I/S to change more rapidly to keep up with the change in our institutions. I/S will only be adaptable if it is designed to be adaptable. Hardware and software must be adaptable from the start.

At PSU and WSU there is a definite trend toward end-user involvement in the design, development, operation and use of information systems. Computing is no longer the domain of a few organizations. It is a commonplace function that is invading every aspect of our institutions. End-users are becoming computer specialists in their own right.

The I/S organization will provide leadership in the future by influence, vision and judicious management of central resources; not by control. In higher education, end-users will continue to exercise a high degree of independence. If the I/S organization has an agenda that makes sense, end-users will follow. If it does not, end-users will pursue their own agenda rather than conform. I/S must lead or the institution will be bound for chaos. It must lead by example rather than by fiat. It must stay up-to-date with the issues and answers.

With the rapidly changing field of technology, there are no simple solutions. Yesterday's strategies are history. New strategies are required in these areas:

- New planning techniques - To achieve a coherent I/S direction it is necessary to achieve a shared vision with end-users; one that the end-users can support and I/S can deliver. The I/S plan must follow the business plan. This plan will leverage scarce people resources and achieve results by evolution rather than revolution. The plan would give highest priority to maximum value projects; those projects that have direct impact on the bottom line of the business.

- New management - Managers are required that recognize that the best solutions are those that contribute to the success of the institution. Hire individuals with a service orientation, not just technicians. The best people have both qualities. Resist the temptation to exclude ideas that were "not invented here." Decentralize expertise and measure success by the success of end-users. Make sure end-users are brought in before launching new initiatives.

- New organization structures - In view of these profound changes, I/S must be placed at a very high level in the organization. Any less and it will compromise the ability of the institution itself to make the hard decisions associated with automation. If in-house I/S is not at a high level, there is a

need for high level consultants (vendors, educators, etc) to step into the breech. Someone must be working with presidents and chief executive officers to influence change.

In higher education there is a special need to overcome the artificial separation of academic and administrative computing as if they are as different as black and white. We can no longer distinguish clearly where academic computing leaves off and administrative computing begins. There is an expanding area of gray.

- New understanding of costs - Computing equipment and software are not a once and done cost item. There are the obvious ongoing costs of backup, recovery, conversion, implementation and maintenance. There are also the people costs of motivation, information dissemination and training. We are particularly concerned about training. The best system in the world is useless without trained people to support it.

- New funding schemes - The more clever I/S managers are those that know how to maximize the impact of scarce computing resources. This can be achieved by working on the most important projects first and seeking alternative sources of funds to cover the costs. The most obvious source for offsetting costs is free or heavily discounted products from vendors. Another source is end-user funding or end-user participation in funding. There is also the opportunity of shedding services that are losing importance in lieu of those that are emerging. Fund sources or offsetting funds are available to those that seek them out. Successful institutions are doing that now.

- New relationships with peer institutions and vendors - Higher education is not alone in information technology. Japan is successful because it recognizes the value of relationships. We are too. PSU and WSU rely heavily on vendors to help with their most difficult challenges. They also work closely with peer institutions.

As you can see from these strategies, the basic principles of management are being rethought. I/S must have a plan. That plan must be realistic and must be agreed by those that have a "stake" in the outcome, the stakeholders. The plan must also recognize that no institution can afford the full price of technology and "creative financing" is required for the most important parts. We are learning, from experience, that the best institutions have an entrepreneurial spirit by which they generate some of the income needed to finance their programs.

## CONCLUSION

At Washington State University and Penn State University, there is awareness of the need to move forward in computing to prepare for the next generation, the generation of baby busters. More important than employment in the next generation will be quality improvement and productivity. Our nation, our states and our institutions will have to become more productive to maintain our current standard of living and accommodate to the reduced number of workers coming into the work force. It is a real problem which demands real solutions. The computing industry, itself, is being held out as the bridge to higher productivity. If that is the case, and we are the practitioners and educators of computing, shouldn't we have some answers? How are we going to make an impact on our nation if we are not making an impact at home, in our own Universities?

At Washington State University, Penn State University and other higher education institutions, the search for integrated information technology is on. What does it look like? How will we know when we have it? We're not sure. But we think that it has to do with merging academic and administrative computing through cooperative processing. We think that it has to do with a common software architecture, data administration and computer-aided software engineering (CASE.) The challenge is to integrate these diverse concepts into a strategic plan which moves the institution forward. At WSU and PSU we are on the trail. A coherent picture is beginning to emerge, but it still has many soft edges.

# AN IMPLEMENTATION STRATEGY FOR COOPERATIVE COMPUTING AND CAMPUS CONNECTIVITY

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Campuses are experiencing demands for the integration of personal computing, centralized computing, office automation, graphics services, data communication and libraries. Iona College developed ConnectPac to allow the user to access all services from a single personal computer. ConnectPac uses mainframe computing to support a campus computing network. The system integrates personal and centralized computing into a non-technical, menu-driven user environment. ConnectPac supports cooperative processing between the workstation and centralized computing facilities. It has been the foundation for the development of an information systems environment that transparently uses multiple computing platforms. Iona College is participating in a Joint Study with IBM Academic Information Systems to enhance and extend ConnectPac to support additional computing environments.

## INTRODUCTION

In 1984, Iona College identified one of its strategic planning goals to be the integration of computing and information processing technologies in instruction, research, administration and student services. Today, the academic community routinely uses information systems, library and information services, external databases, electronic mail and office systems. These systems may use centralized computing, personal computers or a combination of both services. The convergence of technologies for computing, communication and information services has created an "information archipelago" from previously separate "islands of technology". However, this more powerful environment is also more complex. Non-technical users often found it overwhelming or difficult to work in this new environment.

## ISSUES OF CAMPUS CONNECTIVITY

A closer examination revealed that many of the users' problems were associated with a fragmented computing environment. As computing continues to expand to multiple platforms, these problems will also increase. Services must be mapped to computing environments. Regardless of platform, users must have access to all appropriate data, software and peripherals. Users should see a workstation interface that is consistent across environments. These issues all address the connectivity of people to systems, services, data and other users.

Understanding how the user viewed this "information archipelago" was fundamental to any strategy for navigating it. The user wanted the workstation to be a window to all computing and information services. From this workstation, a user should be able to access any computing platform, computing tool, information system, or information service. The development of the ConnectPac system supports this user view.

## ConnectPac CONCEPTS AND FACILITIES

The ConnectPac project began in 1986. At that time, computing was well established at Iona. All academic and administrative users had access to centralized services and personal computing. Most users were experienced in using a microcomputer as an independent system or as a terminal emulator. LANs had been installed in selected computing laboratories and academic and administrative departments. In developing a strategy for a campus backbone network, Computing and Information Services addressed human factors, technological and economic constraints. The campus network had to be user-friendly and increase the user's satisfaction level. It must provide acceptable

performance levels, be robust and reliable and be able to support a wide variety of microcomputer software. It must also take into account the dynamic nature of networking technology while attempting to provide a least-cost solution.

Iona's approach to a campus network assumed that its users were concerned with receiving network services rather than the specific methodology by which these services were delivered. The decision was made to take advantage of existing computing and communications facilities. In addition to supporting network-like services, ConnectPac would use centralized computing to provide a mechanism for navigating the information resources environment. The shift in academic computing from mainframes to microcomputers had created a new role for centralized computing.

Although users had the ability to use a microcomputer to access both PC and mainframe services, the user was responsible for managing this environment. He had to know the environments associated with each service and understand when and how to change environments. This type of environment did not encourage the use of computing by non-technical users. The goal was to develop an intelligent system which would assist the user in managing the environment. ConnectPac provides a transparent user interface to all computing and information services, regardless of the computing platform. In addition, the transparent mapping of services to environments allows a computing center to change the physical environment without impacting service to its users.

ConnectPac supports transparent cooperative processing between the workstation and centralized computing facilities through the following facilities:

- Single system image;
- PC software distribution facility;
- PC data management facility;
- Print distribution facility;
- User aids, editor and file management utilities.

Single System Image

The single system image component of ConnectPac integrates computing services across computing platforms and operating system environments. A single sign-on facility provides a user with access to all authorized computing services. The unified workstation interface is consistent across computing environments (PC-DOS, VM, MUSIC, VSE/SP) while providing integrated access to mainframe and PC applications. It also provides for integrated usage accounting for mainframe and PC services and facilities.

ConnectPac uses menus to access available software and services. Access to entire menus and/or specific menu entries may be controlled by password protection. The MAKEMENU utility allows an installation or individual user to tailor and organize menus to facilitate access to systems and services.

Software Distribution Facility

One of the more difficult problems in supporting personal computing is the distribution, maintenance, and upgrading of PC software. The distribution of PC software over a local area network did not resolve the problems of allocating software to multiple campuses, departments, and computing laboratories. With ConnectPac, PC software distribution was centralized. PC software is stored on the mainframe which acts as the file server. ConnectPac also collects usage accounting data to assist in the management of PC software. System facilities allow non-technical personnel to install PC software on the ConnectPac network.

ConnectPac's software distribution algorithm prevents the unauthorized copying and use of PC software. There is a facility to limit the number of licenses of software that may be in use at any time. Controlled software is encrypted and loaded directly into PC memory from the mainframe. Checks during execution prevent the use of controlled software outside of the ConnectPac environment. It is because of these controls that Iona College has received permission from software vendors to distribute PC software through ConnectPac.

Data Management Facility

The mainframe is also the file server for the user's PC data files. Each user may create, use and modify virtual PC disks on the mainframe. ConnectPac disks facilitate the sharing of PC data between users and systems. It also provides a mechanism for exchanging data between media type (5.25" vs. 3.5" formats) and uploading and downloading (ASCII and EBCDIC). Users need not individually backup their PC disks; ConnectPac virtual disks are archived as part of daily computing center operations.

The data management facility allows Iona to support a "paperless classroom". Faculty can place coursework materials or assignments on ConnectPac disks. Students can electronically receive these materials, complete coursework requirements, and electronically submit materials back to their faculty. This exchange between faculty and students can be repeated.

Print Distribution Facility

Providing users with access to printers also required thoughtful consideration. The increased use of word processing and desktop publishing generated increased demand for quality output. It became imperative to provide cost-effective access to laser printers, plotters and other special purpose devices.

ConnectPac supports the establishment of a mainframe-managed network of both mainframe and PC (ASCII) printers. Centralized information about printer availability adds flexibility in adding printers to the network or removing printers not in service. Access to "private" printers may be password controlled.

ConnectPac allows the user to dynamically change the preferred printer during a session. The print selection facility provides the user with assistance in choosing a printer: printer location; printer type; maximum output width; availability of graphics support; number of current users; size of print queue; and "estimated time of arrival" for a document at the printer.

User Aids

ConnectPac also supports a variety of user tools:

- Full screen editor;
- Utilities for PC directory and file management;
- On-line help.

ICEDT, the Iona College Editor, is a full screen editor that may be used to edit both PC (ASCII) and mainframe (EBCDIC) files. It supports block operations (move, copy, delete, write to a file), search and replace functions, undo line deletion and automatic backup of edited files. There is also an extensive on-line help facility.

Directory management facilities are available through FSDIR. FSDIR provides point-and-shoot support for the most commonly used PC-DOS functions: edit; copy; rename; delete; browse (type). It allows new users to become productive in PC-DOS without having to learn command syntax. File management utilities have been developed for frequently used functions. PURBAK erases .BAK files at the disk or directory level. BROWSE displays the contents of a file. MOVE renames files across subdirectories. FINDFILE identifies the path for a specific file name. FINDTEXT identifies the path and file name of all files containing a user-specified text string. BIWAY supports the uploading and downloading of files between the microcomputer and the mainframe. All utilities have extensive context-sensitive on-line help facilities.

On-line help is an essential part of the ConnectPac system. The policy regarding access to computing calls for computing to be available from any location on campus, remotely via telephone, twenty-four hours a day, every day. To support this level of usage, Computing and Information Services supplements consulting services with on-line help. The MAKEHELP facility allows publication specialists and user services to easily create context-sensitive on-line help.

## DESIGNING APPLICATIONS FOR COOPERATIVE COMPUTING

The use of ConnectPac as the campus backbone network made it possible to review the design of the college's information systems. Computing and Information Services determined that administrative information systems, mail services, document services, and information services could be improved by taking advantage of the strengths of the different computing platforms.

### Administrative Information Systems

The on-line registration system was the first application to use cooperative computing. The approach now being used calls for a microcomputer with a local printer and OMR reader to interact with the centralized data base and information systems. The student uses an OMR form to submit registration requests. The editing and verification of the requests is done locally at the microcomputer level. When complete, the application controls the transition from stand-alone microcomputer to terminal emulation. The student's registration is processed and the central data base is updated. The student's registration report is downloaded to the microcomputer. The application controls the transition back to stand-alone state where the report is printed. The state changes and processing are integrated and are transparent to both the students and the registrar's personnel. One significant advantage to this approach is the offloading of processing to local workstations. In turn, this increases the ability of the centralized facilities to handle the additional demand for administrative computing.

### Executive Information Systems

The enterprise data bases reside on one processor which is not available to the entire academic community. The Electronic Fact Book and Executive Information System are more widely available and have been implemented on the academic processor. The data for these applications are extracted from the administrative data base. ConnectPac electronically delivers this data to the EIS system. Users may access the data, use microcomputer tools to summarize and present data, or make local copies of the data for

additional analysis. It is ConnectPac that presents these services to the users as a set of menus. Again, the users are insulated from the different state changes and control procedures. ConnectPac's password protection of menus and menu entries controls access to more sensitive functions and data.

Mail Services

Mail services are being expanded to include more than electronic mail. Work is underway to support the electronic delivery of physical mail. Another project in progress is the integration of distribution and receipt of FAX mail with the existing network of ConnectPac services. When these projects are complete, any ConnectPac user will be able to use scanners and local printers to send and receive physical mail. Users will also be able to send and receive a document (physical or electronic) through any FAX system on the ConnectPac network. Users will be notified that they have electronic mail, physical mail, or FAX mail waiting. At a later date, the plans are to extend this to also include voice mail.

Document Services

The ConnectPac network and the expanded mail services has made it possible to extend the scope of supported document services. As part of the ConnectPac Office Automation Project (ConnectPac/OA), the author of a document can electronically collaborate with co-authors and/or reviewers, both on-campus or off-campus. A library of documents, images, and boiler plates will be available. Revision and editing could be done by the author or a document processing center. Final copy could be produced by a document processing center using desktop publishing tools. The finished product could be published, reproduced or mailed to an electronically defined distribution list.

Information Services

Library services are currently available to the academic community. The college is using the NOTIS system which is available on a system separate from the environment used by faculty and students. However, the ability of ConnectPac to promote a single system image makes this allocation of systems to processors transparent to the users. Accessing the library system is simply another choice on a ConnectPac menu. Again, the system handles the changes from one computing environment to another. It also returns the user back to the point from which the library system was accessed.

There are plans to add external data bases and CD-ROM data bases to the scope of supported ConnectPac services. There are also plans to support peer-to-peer communication which would allow a user to access a librarian from a workstation and receive assistance in doing reference or research work.

## CONCLUSIONS AND RECOMMENDATIONS

The increased use of computing and information services and multiple computing environments presented a considerable challenge for technology management. The ability to present the users with a set of integrated, user-friendly services has increased the number of computing users and the extent to which computing and information tools are used in problem solving.

In order to achieve this goal, the college developed and implemented a flexible campus backbone network and a mechanism for allocating services to computing platforms. The development of a user interface to control the environment and promote cooperative computing was a fundamental part of this project. The ability to deliver information technology resources to the user's desktop is becoming a reality.

There are also institutional benefits to these directions. The connectivity project has promoted greater productivity among faculty, students, and administrators. It has supported and promoted the diversity of academic interests. While allowing individuals to optimize their own interests, it has helped to minimize institutional costs.

# Rensselaer Libraries Online Information System

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Rensselaer Libraries Online Information System, INFOTRAC, runs on the campus mainframe computer on SPIRES Software. The system is more than a traditional catalog of books and journals, including records for slides, sound recordings and software and also including information on items which may not be in the libraries holdings. The system is available on the campus network and through NYSERNet.

The libraries holdings and access to remote bibliographic databases are an important part of the information techology which must be integrated into campus planning in order to meet academic and administrative campus needs.

# RENSSELAER LIBRARIES ONLINE INFORMATION SYSTEM

Our conference theme is the effective integration of information technology within the framework of institutional objectives, i.e. Making it all fit. I will be talking with you today about a piece of information technology that has often not fallen within the purview of computing on many campuses, and yet, which many, of you will probably be involved in integrating into your campuses information technology in the not too distant future. This piece of information is primarily bibliographic information, and moved into the campus information technology arena in the 80s, when libraries began to make bibliographic information available on campuses through online public access catalogs (OPACs).

In the early 80s Rensselaer made some decisions that today place our system in the forefront of those integrated with other information resources on campus. I wish I could say that we had had a clear plan in place at the time, and that that is what brought us to this fortunate current placement. That is not the case. Then, as now, we were dealing with a rapidly changing technological environment and long-range planning was and remains difficult. In the early days we were responding primarily to financial constraints and the state of library automation. Now, aware of our position, we are capitalizing on it and using it to advantage in out institutions strategic planning process.

This morning I will describe for you where we are, how we got there, and future planned areas of integration of both bibliographic and non-bibliographic resources, both on and off campus.

## WHERE WE ARE

When you sign on to our system today you see the following welcoming screen.

```
                    WELCOME TO INFOTRAC
                RPI Libraries' Information System

To look for BOOKS.................................type CATalog
To look for JOURNALS..............................type JOUrnals
To look for NEW BOOKS.............................type ORDers
To look for HOMEWORK ASSIGNMENTS..................type HOMework
To look for ARCHITECTURE SLIDES...................type SLIdes
To look for IEEE articles or papers...............type IEEe
To display library NEWS bulletins.................type NEWs
To send us a MESSAGE..............................type MESsage
to END session....................................Type STop
```

Note that the welcome is to the Libraries Information System, not to its catalog. Only two of the files contain what most other OPAC's do, i.e. the book and journal holdings of a library. Libraries traditionally cataloged their books and journals and this is what typically appears in OPACs. When libraries automated their paper bibliographic records they typically converted their card catalogs to electronic format. Other information formats such as television tapes, database tapes, phonograph and sound recordings, microforms, and slides were not typically found in card catalogs and hence are not typically found in OPAC's either.

Our system currently contains records for photographic slides. The SLIDES file represents bibliographic records for our large collection of art and architecture slides, one of those formats not typically included in catalogs. The slides were indexed using the Getty Art and Architecture thesaurus, and records were entered into the online system.. The users now have access to any piece in the collection from multiple points, not simply from a single one such as geography or architectural feature, as they did in the manual systems.

The slides file contains bibliographic records for a format not typically found in library catalogs, and it is possible because of our committment to eventually make bibliographic records for all formats available in the catalog. Attempting to find something on cave painting yielded this record.

| | |
|---|---|
| TITLE | Cave drawing,<br>Font-de-Gaume<br>Reindeer, photo |
| SUBJECT: | Cave Drawings<br>Caves at Font-de-Gaume<br>paleolithic,<br>Magdalanian culture<br>wall painting, Upper<br>Paleolithic, Pre-<br>historic Drawing,<br>Cromagnon |
| SITE: | Les Eyzies-de-Tayae,<br>Dordogne, France |
| DATES: | 15000BC - 8000BC<br>mural<br>Franco Cantabrian |
| SIZE: | 3.5 x 4 in b&w |
| CALL NO: | 0:3 |

The next file, IEEE, represents information that patrons have long desired in library catalogs, i.e. article level access to periodical articles and journal conference papers. These have typically been provided outside of the library catalog, originally in print reference tools called abstracts and indexes, and more recently as online databases, which were originally offshoots of the printing process for the paper tools. Until very recently libraries accessed these remote databases for individual patrons in response to a specific search request. The most recent development is that the producers may lease tapes to the campus or provide service directly to patrons, typically with simplified, or user-friendly search software. The tapes may be housed for campus access on the campus mainframe or on a library computer. This is one of those areas in which library and computer center functions have begun to converge.

Here are some of the records that a search for information on computer aided design turned up in the IEEE file.

Welcome to IEEE

IEEE is a database listing journal articles and conference papers of the Institute of Electrical and Electronic Engineers. Currently dating from January 1988, IEEE will be updated and continue to grow.

IEEE differs from the other INFOTRAC databases in several ways:

* IEEE includes abstracts of conference and journal papers.

* IEEE includes some material that is not owned by the Library

* IEEE does not always list a call number for a title that is owned by the Library.
While call numbers are always listed for IEEE journals owned by the Library, they are not listed for the conferences. You have to check the CATALOG database to see if the Library owns an IEEE conference.

| NO. | DATE | PUB. | TITLE | BY |
|---|---|---|---|---|
| 1 | Nov 87 | IECON | An AI approach to computer aided design | El-Dessouki |
| 2 | Nov 87 | IECON | Computer aided design | Furuta |
| 3 | Nov 87 | IECON | Computer aided design of electrical mach | Krishnan |
| 5 | Nov 87 | MONCPN | Design considerations for computer aided | Pruufer |
| 6 | Nov 87 | IEMBS | Use of a computer aided design in pharma | Segui |
| 7 | Oct 87 | ICSMC | The computer aided design of real time s | Ammar |
| 9 | Dec 87 | MICRO | A computer aided design automated syste | Chen |

BY: Krishnan, R.;
Aravind, S.;
Materu, P.;

TITLE: Computer aided design of electrical machines for variable speed applications 87 IECON

CONFERENCE: International Conference on Industrial Electronics, Control

PLACE HELD: Cambridge, MA, USA (11/03/87 - 11/06/87)

PUB. DATE: November 1987

CITATION: p. 756 - 763

ABSTRACT: The development of interactive software for the design of a motor intended for variable-speed applications is presented. The use of finite-element analysis methods is proposed as an indispensable part of the computer-aided design (CAD) system for electrical machine design. An illustration of the method is given for the design of a switched reluctance motor.

REFERENCES: 25

In providing journal article access the way is opened to providing access through the information system to items that may and or may not be in the collection because most of the files are produced by database producers such as IEEE, Chemical Abstracts, etc. and made available either through the producer or a database vendor such as BRS, DIALOG, STN. Hence this is no longer a catalog, or list of library holdings but represents a return to something librarians have long called a bibliography, i.e. a listing of books, journals or articles on a certain subject.

MESSAGE is another unique feature of the system which permits interaction with users. A library user can send the library mailbox a reference question or criticize the system, which they often do. (I use criticize in the true sense, ie. to judge or evaluate.) The users point out features they like and let us know where they think the system is lacking. We do pay attention and have made system enhancements suggested by users.

What is unique about our system? Several things.

1. It is more than a catalog. As I have pointed out, it includes some formats normally not cataloged which are in the library and it contains reference to items that may not be in the library.

2. The second unique feature is that the system is available to users throughout campus. The catalog has not only become an information system, it has moved out of the library. INFOTRAC runs on the campus mainframe, an IBM 3090D, on SPIRES database software. It can be accessed either as a mainframe file or through a Network server, providing no charge access to the database. Most other OPACs, in addition to being JUST catalogs, are purchased through a library vendor and run on a separate computer which is installed in the library (or sometimes in the computer center) or is at the vendors and is accessed through telecommunications. The library must accept whatever search capabilities the vendor provides and users must access the system in the library or are limited to a small number of dial-in ports for remote users. At times there may be 30 or 40 users accessing INFOTRAC.

## HOW DID WE GET HERE?

How did we become an information system accessible throughout the campus? First we decided very early on to put as many of our catalog records as possible in machine readable form. Back in the late sixties librarians envisioned that the computer would be a much better way to store its bibliographic records than 3" x 5" inch cards. We developed the MARC record. MARC stands for machine readable catalog record. This is a standard format that specifies where all the elements of bibliographic description and subject terms which may be in a bibliographic record should be. Originally this was developed for books and journals, and, more recently for all formats acquired by libraries, e.g. software and manuscripts and allows Rensselaer and all other libraries to include their format in their catalogs. This standard MARC record then allowed us to catalog cooperatively, to compile our own records for further manipulation, and eventually to share or transfer records.

This progress was possible cause we embraced new technology as it was developed for other fields. As Kenner[2] said, "One lesson the past has to teach is that every new technology, when it applies for admission to a citadel of the intellect, has invariable received its first welcome from the librarian." So we embraced telecommunications, and the OCLC and RLIN networks were born. Librarians located records from or contributed cataloging records to central locations via telecommunications, and the OCLC and RLIN databases have grown since the early 70s to their present sizes of more than 18 million records each. Libraries were able to locate information about books and journals and request the actual items electronically, thus greatly improving resource sharing. But, for the most part, access to these databases remained in libraries, used by catalogers first, then interlibrary loan librarians, and then, within the last few years they were made available to library searchers as remote databases through database vendors. The librarian remained for the most part as a gatekeeper, accessing these resources for the user.

In the 80s libraries began to use the cataloging records which they had contributed to OCLC or RLIN and stored on magnetic tape, to produce local OPACs. At the same time that this was happening in library land, computer centers were experiencing the growth of the use of personal computers on our

campuses. Users wanted to be able to have computing power at their fingertips on a desktop machine, and to use the same desktop machine to access the mainframe when greater computing resources were required. Campus networks began to emerge.

## WHERE ARE WE GOING

Now library information networks and campus computer networks usually exist independently on campus. Rensselaer's placement on the campus computer makes us available to scholars in a way similar to the campus mainframe and the files or software available to them through the mainframe.

This record, for example, shows that this title is not charged out and that the user can expect to find it on the shelf if he decides to visit the library.

| | |
|---|---|
| BY: | Corbin, John Boyd |
| TITLE: | Managing the library automation project |
| TITLE-NOTE: | John Corbin |
| PUBLISHED: | Phoenix, AZ: Oryz Press 1985 |
| SUBJECT: | Libraires--Automation |
| CALL NO: | Z678.9 .C635 1985 |
| OCLC NO: | 1234285 |
| LC CARD NO: | 85-15461 |
| ISBN: | 089774151X |
| DESCRIPTION: | vi, 274 p. : ill.; 24 CI |
| NOTES: | Includes index. Bibliography: p. (261) - 267. |

| BARCODE | COLLECTION | DESCRIPTION |
|---|---|---|
| 1769090W | | |

| COPY | STATUS | DUE DATE |
|---|---|---|
| | AVAILABLE | |

The library has moved out of its building and joined the other information resources on campus. This is making possible some new connections. RPI libraries are presently pursuing 2 tracks: the first is expansion of the information system to include campus resources that are not in the library, both book and non-book resources. People from other units on campus have begun to approach the library, asking for assistance both in organizing their own databases and in making some of their resources available through the system. The obvious advantage for the scholar here is that he/she would have access to a multiplicity of resources using the same system and search software.

Let me give you 2 examples. The Career Development Center has a collection of books, pamphlets and articles about job hunting, resume writing, interviewing, etc. The Library also has similar materials. The Career Development Center has asked to have their resources listed in our system. We have also been approached by the Registrar to make the Schedule of Classes and the Course Catalog available online, and the bookstore has asked us for help in adapting our online acquisitions system for their use.

Librarians have great skill in the organization and retrieval of bibliographic information, but there is a great deal of carry over possible to the organization and retrieval of other types of information as well. Here of course we may overlap with functions that have typically been the responsibility of either the computing center or administrative computing, if a separate unit exists. The scholar has a large number of information pieces which he may need to integrate. Schematically they look something like this. See Figure 1, page 8.

The second track which we are exploring is to take advantage of our membership in NYSERNet to bring formerly remote databases to the scholar's desktop, not, as many libraries are, by leasing tapes and mounting them locally, or by subsidizing searching on the remote services such as BRS AFTERdark or DIALOG's Knowledge Index, but by providing direct terminal to terminal access through the network. Let me give you a little background.

NYSERNET, part of the NSF Internet, is a high speed telecommunications network that links universities and industries within New York State providing electronic mail, access to the Cornell supercomputer, teleconferencing, and promises library research and remote education. I am chair of the NYSERNet Information Resources Committee, which has responsibility for recommending what library resources should be available on the network. We have made a recommendation that NYSERNet pursue making 4 information tracks available over the network directly to scholars.

| Track 1 | Track 3 |
|---|---|
| National Bibliographic Utilities<br>OCLC | Non-Bibliographic Databases<br>United States Patent and Trademark Office Classification Database<br>The New York State Census Database<br>New York State Legislative Retrieval Service |
| **Track 2** | **Track 4** |
| Bibliographic Databases<br>BRS<br>DIALOG | Library Catalogs<br>New York State Library |

At present the Network is in active negotiation with BRS to make its product available over the network and with OCLC to make the new reference product available. The reference product is the entire OCLC online Union Catalog, with holdings, with a user-friendly front-end interface.

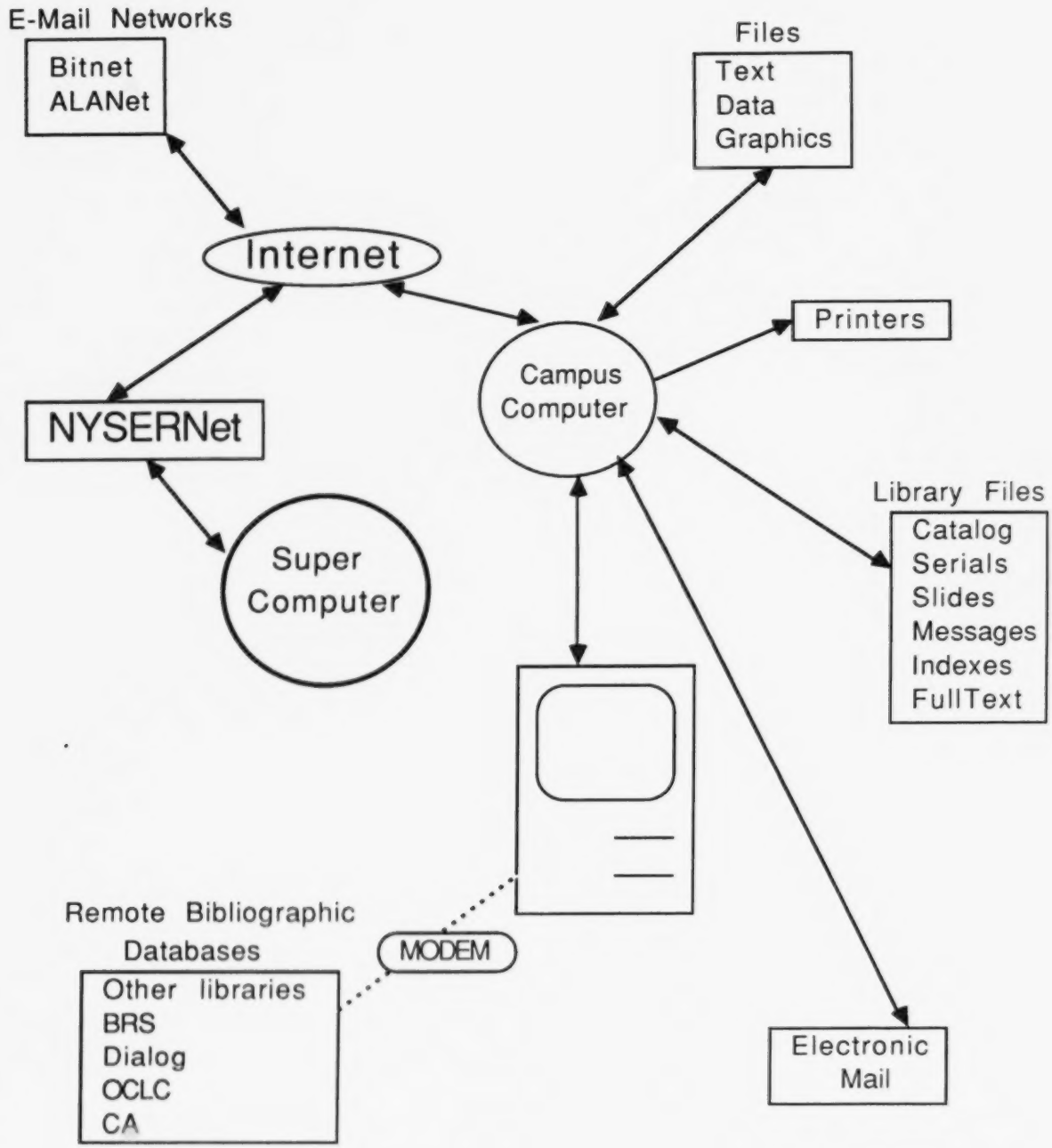
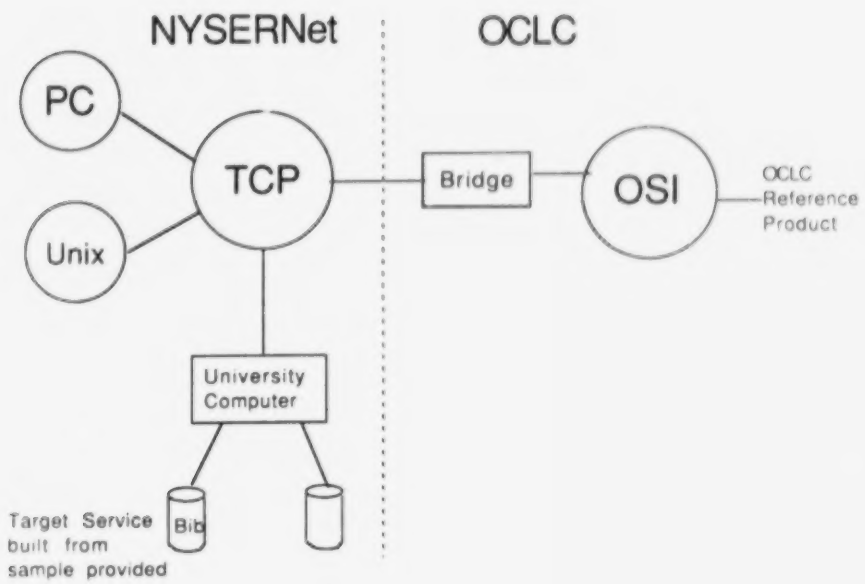

E-Mail Networks
Bitnet
ALANet
Files
Text
Data
Graphics
Internet
Printers
Campus
Computer
NYSERNet
Super
Computer
Library Files
Catalog
Serials
Slides
Messages
Indexes
FullText
Remote Bibliographic
Databases
Other libraries
BRS
Dialog
OCLC
CA
MODEM
Electronic
Mail

Figure 1

Before these databases can be made available to the scholar it is necessary that NYSERNet complete a missing link. NYSERNet is a TCP/IP network and, in order for the OCLC reference product to be available it is necessary that there be a bridge between the ISO/OSI protocols of the library community and the TCP/IP protocols of the NSF Internet of which NYSERNet is a part. NYSERNet has almost completed work which will allow direct computer to computer transmission of bibliographic data using the Z39.50 Information Retrieval Service Definition and Protocol Specification for Library Applications between TCP/IP networks (which NYSERNet is) and the library networks which are primarily (or soon will be) ISO standard. This work will permit direct computer to computer transmission of bibliographic information on existing networks before migration to the ISO standards is completed. Diagramatically that looks like this.




The work should be completed early next year. When it is, the separate access line labeled MODEM in figure 1 will be eliminated and the scholar will not have to have a separate contract with the database vendor or come to the library to use a terminal, thus bringing another wide range of bibliographic services to the user's workstation.

## CONCLUSION

Having the library's information system available on the local campus network and remote bibliographic resources available to scholars on the Internet is going to change user expectations not only for library service, but for other information resources. I expect that the 90s will see a great deal of collaboration amongst library and computing services staff.

## REFERENCES

1 Buckland, Michael K. "Bibliography, Library Records, and the Redefinition of the Library Catalog." Library Resources & Technical Services, to be published Fall 1988, 32(4).

2 Kenner, Hugh. "Libraries and Glowlamps: A Strategy of Reassurance. "Scholarly Publishing 18:October 1986, p.17.

3 Lewis, David. "Inventing the Electronic University." College & Research Libraries 49(4):291-304.

# THE UWSP M-SYSTEM:

# TOOLS AND A TURNKEY SYSTEM FOR A COMPLETE ACADEMIC NETWORK OPERATING ENVIRONMENT

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Bruce Staal
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**ABSTRACT**

During the past four years, The University of Wisconsin - Stevens Point (UWSP) has developed software to provide a menu driven environment for its computing network. The system is designed to meet the special computing needs of faculty and students. Grant support from AT&T has made it possible to move the software from a series of in-house tools to a fully documented product and place the resulting system in the public domain as the "UWSP M-System".

The M-System solves many problems encountered in creating an academic network. With this system someone with little network experience can set up and manage a fully functional academic network. Our presentation will consist of an overview and demonstration of the system.

## OVERVIEW

The UWSP M-System was developed over a period of four years to provide an operating environment for the campus network at the University of Wisconsin - Stevens Point. The M-System was developed for the AT&T Starlan network, but the ideas are applicable to any network environment.

Special care was taken in the development of the M-System to insure that it would meet the needs of a wide range of potential users.

> The Turn-key System is designed for setting up and running a computing laboratory where there is little computing expertise beyond a basic knowledge of MS-DOS. Network software, with a default set of operational menus, can be installed and made operational in less than two hours. The network administrator can then learn how to customize the network while it is in operation. The documentation contains simple step-by-step instructions for beginning users.
>
> The M-System can also be viewed as a set of modules or tools, any of which may be used to help run a network. The documentation includes complete information, including many diagrams, showing how the modules function.
>
> For advanced users, source code is available so that the modules may be modified as desired.

Most network software is designed primarily to facilitate shared access to databases and peripherals. Network users gain access to data or disk space by using accounts and passwords much as they would on a timesharing computer. An individual user usually has access to only a small number of network services. The feeling is that of a closed system with access only to the privileged.

In an academic environment the primary use of the network is to provide software service and access to processors information. The feeling should be that of an open system which invites widespread use. Most network users can store their data on floppy disks or their own hard disks so that it is not necessary to have an elaborate account system.

The UWSP M-System was designed specifically for the academic environment. The menu system clearly displays all of the network services and invites use. At the same time the System protects the software and the network from tampering; creating an open, but protected, environment.

## DESCRIPTION OF THE M-SYSTEM

The UWSP M-System is an MS-DOS workstation based software package along with documentation. The M-System software runs over the server software to create a menu-driven user environment specifically designed for an academic computing network. The M-System also provides a menu-driven environment for the network administrator. In addition, the documentation gives step-by-step

instructions for initial setup of an academic network along with a wealth of information on developing and maintaining the network.

The M-System was developed to run on the AT&T Starlan network. Source code is available and users are welcome to modify and adapt the system to meet their needs. The system is quite modular and several parts may be used individually without using the entire system.

## FEATURES OF THE M-SYSTEM

### Simple Installation

The UWSP M-System along with the server software can be installed on an AT&T Starlan network in less than two hours. Instructions can be carried out by anyone with a basic knowledge of MS-DOS and some experience with MS-DOS based computers.

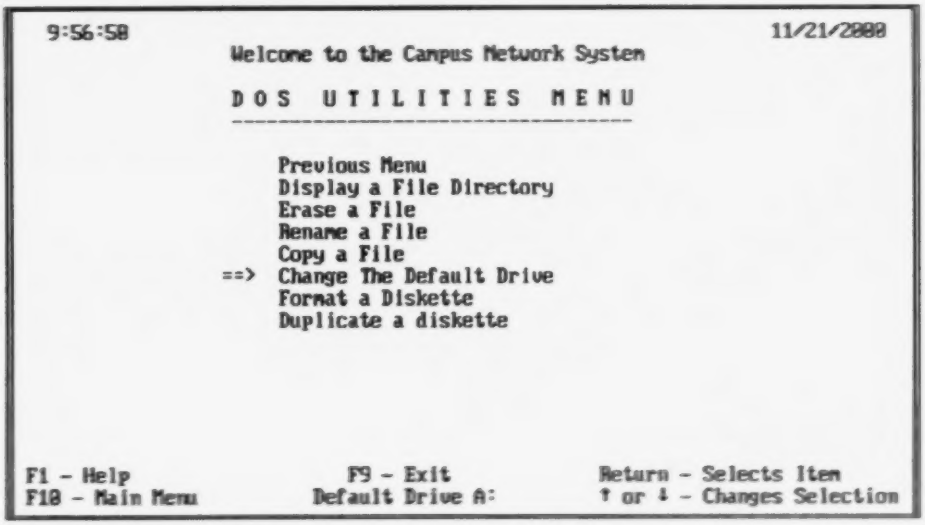
### User Menu Environment

Upon completion of the installation process, the network has a default set of menus running. The Main Menu will appear as follows:

```
17:13:42                                                    11/6/2000
                    Welcome to the Campus Network System

                              MAIN MENU
                              ---------

                ==>  Applications Menu
                     Courseware Menu
                     Program Development Menu
                     Terminal Emulation Menu
                     Printer Association Menu
                     DOS Utility Menu
                     Exit to DOS




F1 - Help                F9 - Exit                Return - Selects Item
F10 - Main Menu          Default Drive A:         ↑ or ↓ - Changes Selection
```

Go to the Applications Menu (word processors, databases, spreadsheets, etc).

The Utility Menu has a complete set of selections all of which are active after the installation process is complete.

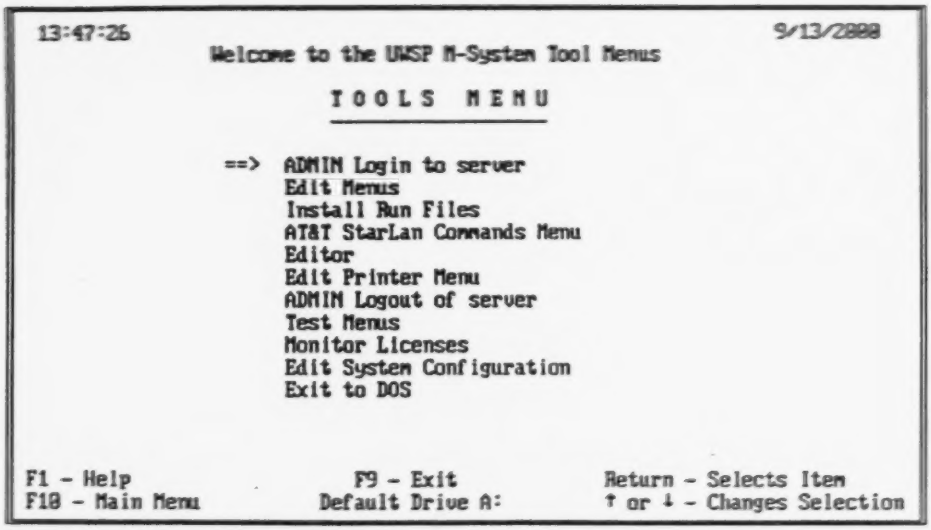



Change the drive DOS recognizes as the Default disk Drive.

The network administrator will add software to populate the remainder of the menus. Additional menus may be added and existing menus modified by using the Menu Editor which is described below.

## Menu-driven Administrative Environment

The network is administered from a special menu called the Tools Menu. From this menu the administrator edits the menus, adds software to the network, adds printers to the network, and performs other administrative tasks. The Tools Menu appears as follows:

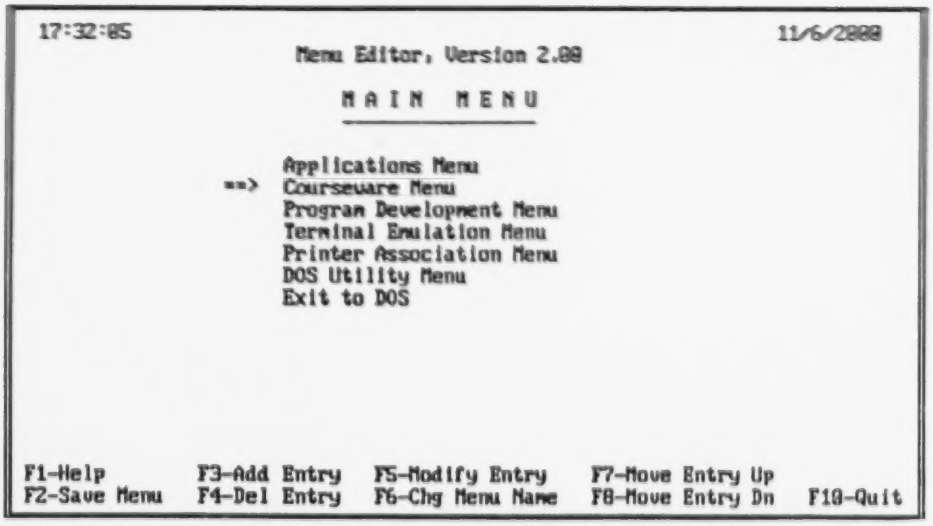



Log in as ADMIN on the server defined in the system configuration file.

The functions of several of these selections are described below.

Menu Editor

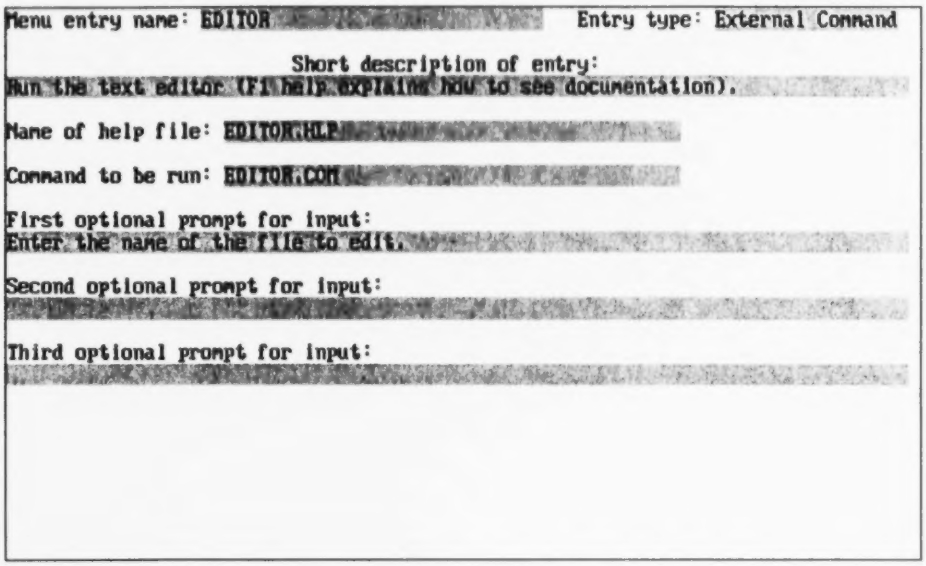
At first glance the Menu Editor looks like any other menu on the system.




Go to the Courseware Menu (tutorials, simulators, class specific programs).

However, further examination reveals that the function keys may now be used to edit the menus. The menu editor is used to add new selections, change the menu name, add new submenus, and, in general, customize the menu structure. The process of creating menus and selections is very visual and interactive. New menu selections are active upon leaving the Menu Editor.

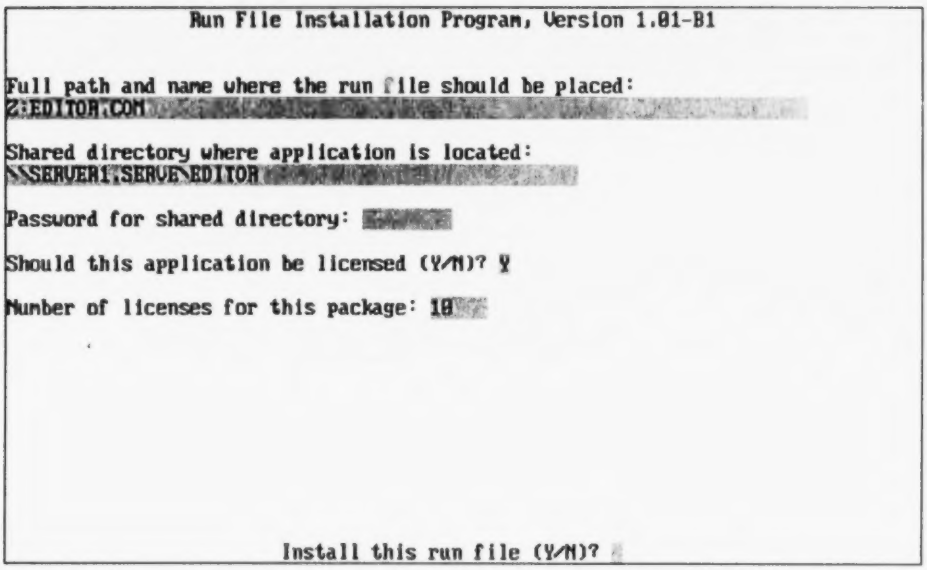
The process of adding a new menu selection is just a matter of pressing <F3> and then filling in the blanks on the screen as the following example shows.




Software Installation System

The M-System provides tools to aid in the installation of applications on the network. Applications are installed in a systematic way using a step-by-step process detailed in the documentation. The installation of each application is documented using a standard format so that modifications may be easily made at a later date, if necessary.

The Run File is a file created by the M-System to connect a menu selection to the software to be run. The Run File also contains information on licenses which are discussed later in this paper. The information in the Run File is encrypted so that network users cannot find the location of the software and the password of the shared directory. Run Files are created by filling in the blanks on the screen as the following example shows.




The documentation has an appendix containing Application Installation Kits. These kits contain detailed information on installing specific applications. If a kit is available for an application, the installation is a routine process, since the kit provides solutions to problems which arise in the installation of that application. M-System users are invited to submit Application Installation Kits for applications not already supported so that they may be shared with other users.

Unfortunately, the installation of applications on a network is generally not a straight forward process and there are often problems of various kinds that arise. The M-System deals with these problems by establishing a regularized procedure for installing applications and providing Applications Installation Kits as a means of sharing solutions to installation problems.

## License Control

The M-System provides a mechanism for controlling the number of active copies of an application on the network. When an application is installed, the number of licenses is given. The M-System keeps track of how many copies are active and, when all licensed copies are in use, it informs the next user that all copies are in use and suggests trying again later.

The license control feature makes it possible to provide software on the network without a site license. In many cases just a few copies are sufficient to serve a large number of users. Using this feature, the network may also be used as a mechanism for delivery of a software evaluation library.

The License Monitor provides for real-time monitoring of network activity. The monitor, which is available from the Tools Menu, is shown in the following:

License Monitor Version 2.00-B1

| License File | No. Lic | In Use | Used | Errors |
|---|---|---|---|---|
| DBASE.LIC | 5 | 2 | 0 | 0 |
| MTABF.LIC | 15 | 0 | 2 | 0 |
| MTABS.LIC | 9 | 0 | 1 | 0 |
| FRAMEWRK.LIC | 14 | 0 | 1 | 0 |
| SYMPHONY.LIC | 14 | 0 | 2 | 0 |
| PFSPUB.LIC | 1 | 0 | 0 | 0 |
| ASM.LIC | 3 | 0 | 0 | 0 |
| VCAD.LIC | 10 | 0 | 0 | 0 |
| CORE.LIC | 5 | 0 | 1 | 0 |
| SIDEWAYS.LIC | 1 | 0 | 6 | 2 |
| LEARNDOS.LIC | 10 | 0 | 0 | 0 |
| FLOPYDOS.LIC | 10 | 0 | 0 | 0 |
| HARDDOS.LIC | 10 | 0 | 0 | 0 |
| PYXELVI.LIC | 10 | 0 | 3 | 0 |
| PYXELBP.LIC | 10 | 0 | 1 | 0 |
| OVERHEAD.LIC | 10 | 0 | 3 | 0 |
| EMGRAPH.LIC | 10 | 1 | 11 | 0 |

F1 - Help

F2 - Chng in use count

F3 - Chng No. licenses

F4 - Print report

F5 - Clear all stats

F6 - Delete lic. file

F10 - Exit

↑ ↓ - Change highlight

The License Monitor gives the numbers of licenses owned, the number currently in use, the number of times the application has been run since the last time the statistics were reset, and an indication of when it is time to purchase additional licenses. The Monitor can handle any number of applications by scrolling them through the on-screen window. A complete report of license usage can be printed at any time.

PC Type Identification

The M-System is able to identify the type of graphics board on a network PC so that the proper software configuration will be sent to each client station. This eliminates having to ask the user (the user often doesn't know) and makes it possible to have computers with several types of graphic boards coexisting on the network.

Terminal Emulation

Terminal Emulation may be used to access a Unix based server on the Starlan network or any processor attached to a terminal server.

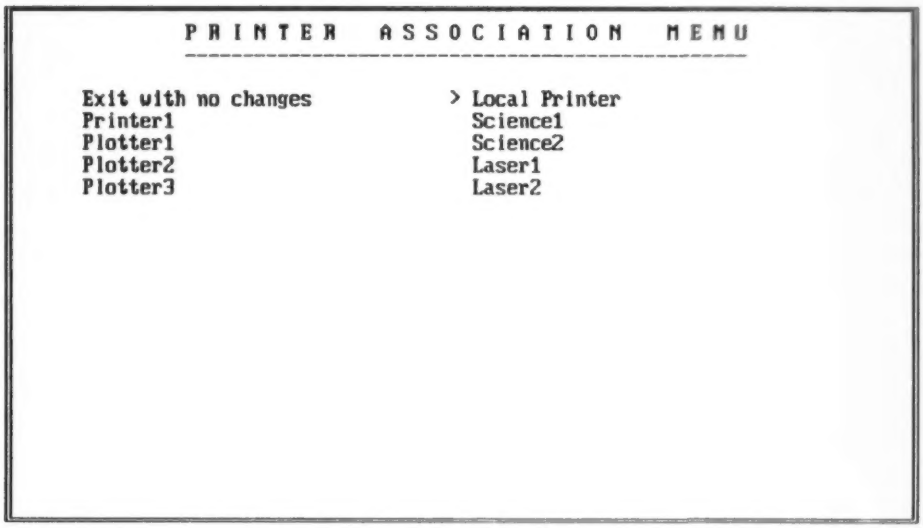
The documentation provides instructions for using Kermit to support various terminal emulation activities. Kermit is available for cost of reproduction and materials from Columbia University. It has built in support for the Starlan network.

Kermit includes scripting capability which makes it possible to redefine the keys to match various terminals or the needs of a particular application. The

scripting may also be used to take a user from an M-System menu selection to an application on a network processor (i.e., it can call the computer, login, and run the application; e.g., an on-line library catalog.). Scripting is a powerful mechanism for maintaining user friendliness in the M-System when under terminal emulation.

Printer Association

The Printer Association Menu is available from the default Main Menu. From this menu, users may link to any network printer which has been allowed by the network administrator.




The Printer Association Menu is administered with the Printer Association Editor which is accessed from the Tools Menu. The network administrator names the printers and places them on the menu through this editor. A password may be used, if desired, with any printer to control access.

## CONCLUSION

The UWSP M-System is a software package, along with documentation, which may be used in a variety of ways in the installation, development, and maintenance of academic computing networks. The package may be used as a whole to install a "turn-key" system or parts of it may be used separately. Using available source code users may modify the programs to meet their needs.

It is our hope that by using this system, campuses will be able to avoid "re-inventing the wheel" and will be able to build on the solutions provided in the System to provide more and better services to their users.

# CCNEWS: An Electronic Newsletter and Articles Database

**by Daniel A. Updegrove, Sheldon B. Smith, and Wendy Rickard Bollentin**
**EDUCOM, 777 Alexander Road, P.O. Box 364, Princeton, NJ 08540**
**CCNEWS@EDUCOM.BITNET**

**CCNEWS: An Online Forum for Campus Computing Newsletter Editors is a service of EDUCOM that combines a weekly electronic newsletter with an articles database. Over 750 subscribers in the United States and abroad find in CCNEWS a peer group communications medium, a mechanism for improving their own publications, and a glimpse into the future of electronic publishing.**

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On April 8, 1988, EDUCOM sent the first issue of CCNEWS, an electronic newsletter, to 78 subscribers. Two weeks later the subscription list had nearly doubled, and within three months it exceeded 450 subscribers. After nine months of publication CCNEWS is still evolving, yet this experiment in information sharing offers valuable insight into the future of networking and information dissemination.

Developed by EDUCOM as a membership service, CCNEWS combines an online weekly newsletter for campus computing newsletter editors with an articles database. Thus CCNEWS provides both a forum for editors to discuss design, writing, editing, production, and distribution of newsletters (Appendix 1) and a database from which relevant articles can be retrieved for research or reprinting (Appendix 2). In addition, a calendar of events (Appendix 3) has been added to assist editors in reporting on relevent conferences, seminars, and workshops. The newsletter is distributed, and the archive and calendar are accessed via BITNET, the academic network that now connects over 700 campuses in 30 countries.

CCNEWS is based on the "moderated list" format of LISTSERV, the mailing list/file server software available on many IBM host computers on BITNET (Appendix 4). Moderated lists enable an editor to intercept and filter messages intended for a group; many editors assemble the messages into occasional digests or regular newsletters. Unmoderated lists, on the other hand, tend to be more freewheeling, since every message is sent to the group immediately, without editing or selection; although subscribers may appreciate the immediacy of an unmoderated list, they risk an onslaught of irrelevant messages (each with its own lengthy mail header).

Subscribers are encouraged to send questions, comments, and suggestions, which are compiled by the EDUCOM Publications staff into the weekly newsletter, as well as complete newsletter articles and other materials, which are archived for possible retrieval. A brief abstract of each archived entry is included in the newsletter, but the full text is sent only on demand. In addition to newsletter articles, the archive includes sample stylesheets, book reviews, and brochures. Claudia Lynch from the University of North Texas envisions, "CCNEWS serving as a vehicle from which I can gather articles for reprinting in my newsletter and from which I can gain inspiration on research topics I might otherwise have ignored."

Discussions in CCNEWS have ranged from desktop publishing, graphic design, and electronic publishing, to computer viruses, microcomputer support, and strategic

planning. Typical queries relate to attribution policies, documentation, and software usage; one subscriber even asked the group what journals they find most relevant. Readers have responded to questions, offered expertise and experience, and helped fellow editors avoid pitfalls. To facilitate the exchange, all contributions include bylines with electronic mail addresses so subscribers can contact authors directly.

CCNEWS is open to anyone who has access to BITNET, either directly or via gateways from other networks. Subscribers include editors, writers, graphic artists, networking specialists, and a variety of computing facility managers and staff. Mary Peterson, from the University of New Hampshire, wrote, "I am not a campus newsletter editor, but I do assist with our computing newsletter, *On-Line*, and I find CCNEWS interesting, relevant, and helpful."

CCNEWS has also attracted international subscribers. A recent count totaled 22 individuals from Europe and Asia, and the number is growing steadily. Since hard-copy newsletters rarely find their way to foreign institutions, CCNEWS promises to be an effective medium of international information exchange.

## ORIGINS

EDUCOM has been a leader in inter-university computer networking since the mid-1960s[1] and always tries to "practice what it preaches." EDUNET, with its online database of instructional resources, was an early example, soon followed by EFPM, a network-accessible financial modeling system popular in pre-spreadsheet days, and Mailnet, an inter-campus electronic mail system. Current projects include operating the Network Information Center for BITNET (under contract with BITNET, Inc.) and staffing the Networking and Telecommunications Task Force (NTTF), which is pursuing partnerships with government and industry to develop the national education and research network.[2]

When the EDUCOM Publications staff observed and experienced the "look and feel" of electronic publications, like *Info-Mac*, *NetMonth*, and newsletters from the Association for Institutional Research and the Society for College and University Planning,[3] we were eager to get more actively involved. In parallel, we observed the marked similarities among the scores of campus computing newsletters, and the concept of CCNEWS began to emerge: an electronic newsletter combined with an articles archive. After approval of the concept by the EDUCOM Board of Trustees, CCNEWS was announced at the ACM SIGUCCS Computer Center Management Symposium in March, 1988, and the subscription drive began.

## PROSPECTS FOR THE FUTURE

Developments in network communications — both technical and political — foreshadow the time when electronic publishing and information delivery will compete with or even supersede journals, newspapers, magazines, books — and newsletters. Sophisticated databases as nodes on a network, bibliographic utilities with search protocols that operate through networks, and artificial intelligence systems will eventually become commonplace. Commercial and industrial networks and services could merge with those supporting higher education, resulting in rich resources available at low cost

to scholars and students.

In the meantime, the national network movement in higher education is growing quickly. Paralleling the dramatic growth in the national networks like BITNET and NSFNET are the extensive intra-campus networks being planned and implemented.[4] Universities are spending millions to connect faculty and staff offices to labs, libraries, computing centers, and (in some cases) dormitories. Such developments are, of course, extremely propitious for services like CCNEWS.

The number of campuses with easy access to CCNEWS and the number of connected individuals on these campuses naturally increase the base of both potential contributors and potential readers of this service. As is typical of most groups, early experience with CCNEWS suggests that most subscribers are passive recipients rather than active contributors, but growth in subscribers should result in more contributions, which should add interest — and more subscribers. An alternative source could be syndicated writers, perhaps specialists, who might find such a large audience (both direct subscribers and readers of subscribers' publications) worth their efforts.

For those institutions that are slow to connect to the national and regional networks, EDUCOM encourages nearby institutions to offer guest accounts. Not only will this provide broader access to network services like CCNEWS, but also such an introduction, if successful, could lead the institution to join the network at a later date.

Growth is not always easy to manage, of course. In the case of CCNEWS, the current articles indexing scheme would probably not support 500 articles; it certainly would break down before 5,000. In addition, new subscribers would not necessarily have interests and needs matching the earler ones, perhaps leading to special editions for liberal arts or community colleges. Alternatively, divisions might emerge focused on desktop publishing and/or electronic publishing, independent of campus computing content.

Assuming that both the contributions and indexing problems can be solved, there would be no reason to restrict archive access to campus computing staff. CCNEWS or its successor(s) could become repositories of information for anyone on campuses interested in its topics. This notion dovetails with developments on some campuses, like Cornell's CUINFO, which offer extensive databases of computing and non-computing information to the community.

For the immediate future, however, higher education publications and information resource professionals interested in such services will need to wrestle with such vexing questions as:

- What intellectual property rights apply to network communications?
- Are property rights the same as software and print?
- How should graphics and formatted text be distributed for printing?
- How should electronic newsletters be designed for either online viewing or printing?
- How will hypertext, hypermedia, CD-ROM, and distributed databases effect distribution of information?
- Is an electronic mail address directory feasible?

## CONCLUSION

Michigan State University's Marilyn Everingham finds that, "CCNEWS pulls together a peer group from which information and help can be drawn. Questions can be posed with a good chance of getting an answer from someone who's actually experienced the same problem. Nothing speaks quite as clearly as the voice of experience." Mary Peterson, from the University of New Hampshire, comments that, "CCNEWS is the best list I've subscribed to yet. I'd like to see even more discussions on writing for campus computing organizations including information on books, conferences, and other resources for effective writing and reporting." Tapping into the audience most capable of helping them improve their skills is an invaluable asset to many subscribers. According to Claudia Lynch at the University of North Texas, "I see CCNEWS serving as a window to the world of other computing center newsletter editors. I can console myself, knowing that I am not the only one who suffers from reluctant staff contributors, etc."

Although CCNEWS is not a startling technical innovation, the potential of a worldwide network of campus computing newsletter editors and an easily accessible archive of articles and other materials is exciting. Charity Cicardo at the University of Denver, summed up her experience with CCNEWS this way: "I feel that new doors have been opened. In the future I could be publishing only electronic publications. With exposure to CCNEWS, at least I won't be taken by surprise when it occurs." We agree.

## BIBLIOGRAPHY

1. James G. Miller, et al. *EDUNET: Report of the Summer Study on Information Networks.* New York: John Wiley & Sons, Inc., 1967.

2. "National Net'88 Double Issue: Public and Private Initiatives to Create a National Education and Research Network," *EDUCOM Bulletin* Vol. 23, No. 2/3, Summer/Fall, 1988. (For single copy, contact 609 520-3366 or send electronic mail to PUBS@EDUCOM.)

3. John A. Dunn and John Muffo. "Exhiliration and Exasperation: An Open Letter to Everyone Who Thinks His Professional Association Should Communicate Electronically," *EDUCOM Bulletin* Vol. 23, No. 2/3, Summer/Fall, 1988, pp. 88-92. (Also available online in the CCNEWS Articles Archive.)

4. Carolyn Arms (ed.) *Campus Networking Strategies.* Bedford, MA: Digital Press, 1988. ($20 for EDUCOM members; contact 609 520-3366 or send mail to PUBS@EDUCOM.)

For more information on CCNEWS contact the authors at the address previously listed; call 609 520-3366; or send fax mail to 609 520-3975. Electronic mail can be sent to CCNEWS@EDUCOM.

## Appendex 1

**Welcome to CCNEWS**

You are responsible for editing and producing a newsletter for campus computing and networking users. Your best consultants are too busy doing seminars and answering the hot line to write. You are intrigued by the power of the latest desktop publishing and graphics tools. You wonder about the best mix of newsletters, manuals, mini-memos, online help, and bulletin boards to serve a growing and increasingly heterogeneously user community.

You subscribe to several peer institutions' newsletters, looking for ideas on content, format, new approaches. Many cover the same territory, but occasionally someone does it brilliantly—with insight, style, humor. If only the best pieces were in a database on the network, keyword-searchable, available fo down-loading—with attribution, of course. Short of that, if only you could communicate easily with other editors, sharing queries, answers, hints, gripes, your favorite articles. CCNEWS is the forum you seek. Our hope is that hundreds of editors of newsletters and other information sources in the U.S. and abroad will participate in an online exchange of information and opinion that can:

- •make us more effective
- •improve our campus information services
- •be more fun than ghost-writing the "From the Director" column.

—From CCNEWS Vol. 1, No. 1, April 8, 1988

To subscribe to CCNEWS, send an interactive message or electronic mail to LISTSERV@BITNIC containing the following text: Subscribe CCNEWS FirstName LastName - Institution

## Appendix 2

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CCNEWS Articles Index

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The files below contain articles from campus computing newsletters, EDUCOM publications, and other sources. They are freely available for research and reprinting, with attribution, in newsletters and elsewhere.

Anyone with access to BITNET (directly or indirectly) can retrieve full text by sending the following command to LISTSERV@BITNIC, either as an interactive message or in the first line of a mail message:

GET Filename Filetype

(where Filename is related to the subject and Filetype is usually constructed from the last name and first initial of the contributor).

Also shown in the index are the network address of the contributor (Author@Node), subject key words, the issue of CCNEWS containing the article abstract, the original date of publication, and the file size (in lines).

Back issues of CCNEWS are also available from LISTSERV@BITNIC. Send an interactive message or mail message containing:

SEND CCNEWS XX-000yy

where XX is the year (88 or 89), and yy is the issue number.

Contributions are encouraged to CCNEWS@BITNIC. Please send straight ASCII text, 75 character line, block left, ragged right, one space after periods, and doule spaced between paragraphs. For articles, please include the author(s), institution(s), e-mail address(es), and full citation (publication name, volume, number, date, pages, etc.).

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## Appendix 2 (cont'd)

| Filename | Filetype | Userid | Node | Subject | Issue | Date | Lines |
|---|---|---|---|---|---|---|---|
| ARTICLES | INDEX | CCNEWS | EDUCOM | This file | | | |
| ASCII | ZABLOS_P | USERJON | UBCMTSG | A Stroll Around ASCII | 88:18 | 08/88 | 246 |
| AWARDS88 | ARTICLE | ESI | EDUCOM | Enhancing Learning: 1988 EDUCOM/NCRIPTAL Higher Education Software Awards | 89:01 | 12/88 | 722 |
| AWARDS88 | EDU_NCRI | ESI | EDUCOM | Winners of the 1988 EDUCOM/NCRIPTAL Higher Education Software Awards | 88:20 | | 561 |
| BACKUP | EVERIN_M | 11600ME | MSU | Using Backup and Restore: Essential DOS Commands | 88:12 | 01/88 | 415 |
| BACKUP | HOLLAN_P | PAT | CRNLGSM | Back UP to the Future | 88:22 | | 50 |
| BASICS | LEE_G | ISBalkits | UCDAVIS | From Arcane ASCII to the Printed Page—Computer Basics* | 88:29 | | 103 |
| BBOARD | BARBER_S | AC10 | NTSUVAX | New Bulletin Board Service | 88:13 | 04/88 | 111 |
| BBOARD | EVERIN_M | 11600ME | MSU | Bulletin Boards | 88:9 | 04/88 | 116 |
| BIBLIO | SNYDER_M | SNYDER | UBACS | DTP Bibliography | 88:4 | 01/88 | 43 |
| BRAIN | McPART_T | PAM | GUVAX | Combatting the Brain: A Computer Virus | 88:10 | | 304 |
| BYTING | ROSS_F | USERARQH | RPITSMTS | They're BYTING Today—Fish Catalog On-Line* | 88:31 | | 67 |
| EVENTS | CALENDAR | CCNEWS | EDUCOM | Calendar of Events | 88:14 | | |
| CCNEWS | NAMELIST | GE0110 | SIUCVMB | Sorted by Last Name | 88:29 | 11/88 | 647 |
| CCNEWS | SIGUCCS | CCNEWS | EDUCOM | CCNEWS: An Online Forum for Newsletter Editors | 88:16 | | 379 |
| CHANGE | HARTMA_A | TACVAGH | TCSVM | Plus ca Change | 88:22 | 09/88 | 158 |

## Appendix 2 (cont'd)

| Filename | Filetype | Userid | Node | Subject | Issue | Date | Lines |
|---|---|---|---|---|---|---|---|
| CONFER | EVERIN_M | 11600ME | MSU | An Introduction to Conferencing | 88:8 | 04/88 | 123 |
| CONVER | GILBERT | GILBERT | EDUCOM | The Conversion Experience | 88:15 | 05/88 | 122 |
| DATALOSS | HARTMA_A | TACVAGH | TCSVM | Understanding Data Loss | 88:22 | 07/88 | 68 |
| DIGITAL | CARR_D | NETOPRDC | NCSUVM | Bring Your Macintosh to Life with Digital Sound | 88:19 | 08/88 | 263 |
| DISKBACK | EVERIN_M | 11600ME | MSU | Disk Backup Strategies | 88:12 | 01/88 | 509 |
| DOS | EVERIN_M | 11600ME | MSU | Setting Up and Using Dos On Your Hard Disk | 88:11 | 02/88 | 216 |
| DIRS | EVERIN_M | 11600ME | MSU | Directories and Subdirectories | 88:11 | 02/88 | 302 |
| DTP1 | HOLLOW_J | HOLLOWAY | IUBACS | Desktop Publishing: An Introduction | 88:4 | 03/88 | 136 |
| DTP | HARTMAN | TACVAGH | TCSVM | Ay, There's the Rub | 88:18 | 03/88 | 146 |
| DTP | LYNCH_C | AS04 | NTSUVM1 | Choosing a Desktop Publishing System | 88:13 | 04/88 | 329 |
| EDUCOM89 | BROCHURE | CONF89 | EDUCOM | EDUCOM89 Conference Brochure | | | |
| EMAIL | EVERIN_M | 11600ME | MSU | What is E-Mail? | 88:8 | 04/88 | 107 |
| EMAIL | WALTERS | MWALTERS | UWYO | Electronic Mail: Doorway to the World | 88:14 | 07/88 | 83 |
| EMAILALT | EVERIN_M | 11600ME | MSU | E-Mail Alternatives: Telex and Teletex | 88:8 | 04/88 | 79 |
| EMAILY_P | ANDER_A | ANDERSON | UCLAMVS | Ms. Emaily Post: The Etiquette of Electronic Mail | 88:10 | 03/88 | 209 |
| ENEWS | DUNN_J | SCUP | TUFTS | Exhileration and Experation: An Open Letter to Everyone Who Thinks His Association Should Have an Electronic Newsletter | 88:10 | 06/88 | 339 |
| ERGO | BALKITS | ISBalkits | UCDAVIS | Human Factors in Workstation Design | 88:18 | 08/88 | 48 |

## Appendix 3

### CCNEWS NATIONAL EVENTS CALENDAR

This National Events Calendar contains information about conferences, seminars, and workshops related to information technology in higher education.

Updated weekly, this listing is a service of EDUCOM's CCNEWS: An Electronic Forum for Campus Computing Newsletter Editors on BITNET. For information on CCNEWS, or to contribute material to the National Events Calendar, send electronic mail via BITNET to: CCNEWS@BITNIC

| | | | |
|---|---|---|---|
| Feb 13- 14 | 89 | LaST Frontier Computer Conference<br>Tempe, AZ | contact: 1-602-965-2124 |
| Feb 21- 24 | 89 | 1989 ACM Computer Science Conference<br>Louiseville, KY | contact: 1-212-869-7440 |
| Feb 26- Mar 3 | 89 | SHARE 72<br>Los Angeles, CA | contact: 1-312-644-6610 |
| Mar 15- 17 | 89 | ACM SIGUCCS Computer Center Mgmt Symposium<br>St. Louis, MO | contact: 7ETPPCC@CALSTATE |
| Mar 30- 31 | 89 | Western Educational Computing Workshops<br>Santa Cruz | contact: 1-415-338-1212 |
| Apr 3- 5 | 89 | National Net'89 Conf<br>Washington, DC | contact: NET89@EDUCOM |
| Apr 12- 14 | 89 | Conference of University Administrators<br>Univ. of Sussex, Eng. | contact: + 44 273 678384 |
| Apr 13- 16 | 89 | 5th Annual Inter'l Conference on Computerization of Medical Records<br>Anaheim, CA | contact: 1-617-964-3923 |
| pr 21- 22 | 89 | Small College Computing Symposium<br>Eau Claire, WI | contact: DRALEIGH@UWEC |
| Apr 30-May 3 | 89 | AIR (Association for Institutional Research)<br>Baltimore, MD | contact: 1-904-644-4470 |
| May 14- 17 | 89 | CUMREC'89, College & University Computer Users Conf.<br>Boston, MA | contact: Phil Philips, MIT |
| May 14- 17 | 89 | SHARE 72.5 Interim Meeting<br>Denver, CO | contact: 1-312-644-6610 |
| May 16 | 89 | MUG'89 Tools Workshop<br>Chattanooga, TN | contact: MUG89@UTCVM |
| May 17- 19 | 89 | MUG'89 Conference<br>Chattanooga, TN | contact: MUG89@UTCVM |

## Appendix 3 (cont'd)

### CCNEWS NATIONAL EVENTS CALENDAR

| | | | |
|---|---|---|---|
| May 20- 23 | 89 | 3rd International Conference & Exhibition on Children in the Information Age<br>Sofia, Bulgaria | contact: write to:<br>bl 25A, Acad G Bonchev Str<br>Sofia 1113<br>(Tel) 7131 ext. 620<br>(Telex) 22056 KZIT BG |
| May 21- 24 | 89 | Software Publishers Association Conference<br>San Diego, CA | contact: 1-202-452-1600 |
| May 21- 24 | 89 | American Society for Information Science Mid-Year Meeting (ASIS)<br>San Diego, CA | contact: IIN4CLB@UCLAMVS |
| May 29- 31 | 89 | EARN'89 (3rd International Conference on Networking and User Support)<br>Heraklion, Crete, Greece | contact: LISTSERV@BITNIC file EARN89 Program |
| Jun 20- 22 | 89 | National Educational Computing Conference<br>Boston, MA | contact: 1-617-868-9600 |
| Jul 9- 11 | 89 | NACUBO<br>Philadelphia, PA | contact: 1-609-343-5100 |
| Jul 19- 22 | 89 | First AIR Breckenridge Institute: Information: The Critical Resource For Strategic Management<br>Breckenridge, CO | contact: IRDJT@UKANVM |
| Jul 23- 26 | 89 | Society for College and University Planning Conference<br>Denver, CO | contact: USERTD8Q@UMICHUM |
| Jul 23- 28 | 89 | Sixth International Meeting University Administrators<br>College Park, MD | contact: John Bielec, |
| Aug 4- 9 | 89 | Seminar on Academic Computing<br>Snowmass, CO | contact: DJBIRD@ORSTATE |
| Aug 20- 25 | 89 | SHARE 73<br>Orlando, FL | contact: 1-312-644-6610 |
| Oct 16- 19 | 89 | EDUCOM'89 Conf<br>Ann Arbor, MI | contact: CONF89@EDUCOM |
| Nov 16- 17 | 89 | Western Educational Computing Conference<br>Burlingame, CA | contact: 1-415-338-1212 |
| Nov 28- Dec 1 | 89 | CAUSE89<br>San Diego, CA | contact: CAUSE@COLORADO |

## Figure 4

### LISTSERV

Have you ever communicated with 100, 200, or 400 people at once, even though they were dispersed over great distances? Have you ever had the opportunity to correspond electronically with hundreds of peers on topics of common interest? Have you ever asked a question and received responses from a dozen people around the country and around the world that same afternoon?

This is just what is happening for thousands of scholars, researchers, administrators (and often students), connected to academic computer networks supporting the "mailing list" software called LISTSERV. Generally described, LISTSERV takes an electronic mail message sent to a "list" and distributes it to all of the "subscribers" on that list. Each subscriber can send from his or her own electronic mail system to lists located anywhere on the network. LISTSERV also maintains archives of past messages, which can be retrieved easily.

Currently, over 420 unique mailing lists operate using LISTSERV at sites connected to the BITNET academic computer network, which consists of 380 institutions and over 1500 nodes (separate host computers) in the U.S., Latin America, and Asia. Some of these are "open" (not restricted in access or distribution), some are "edited" (collected and sent out at specified intervals), and others combine these two. List topics range from the very technical (UNIX-EMACS), to the very urgent (AIDSNEWS), and the humorous (Nutworks, a comic magazine). Many lists also cross the Atlantic (to EARN, the European Academic Research Network), and the northern U.S. border (to NetNorth, the Canadian academic network).

For individuals at institutions already connected to BITNET, LISTSERV list subscriptions are free with an account that has access to national networks. For institutions to become members of BITNET, the basic costs include an insitutional fee, modems, leased-line connections, and an electronic mail system to connect to the network.

For more information about LISTSERV lists or BITNET, individuals should contact their local BITNET institutional representative. For more information about BITNET Membership, contact the BITNET Network Information Center at EDUCOM, P.O. Box 364, 777 Alexander Road, Princeton, New Jersey, 08540; 609 520-3377. If you're already on BITNET and want to see a "list of lists", send the command LIST GLOBAL to LISTSERV@BITNIC.

—Adapted from "LISTSERV Software Connects Thousands via Electronic Mail," *EDUCOM Bulletin* Vol. 23, No. 2/3, Summer/Fall, 1988, p. 89. □

**RIVERSIDE COMMUNITY COLLEGE DISTRICT**

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4800 MAGNOLIA AVENUE / RIVERSIDE, CALIFORNIA 92506-1299 / (714) 684-3240

# Innovative Approaches to Integrating New Technologies with Matriculation Efforts Using Smart Card Technology

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For several years, the California Community Colleges have been working to further develop and enhance matriculation procedures. As part of this effort, supplemental monies have been made available to support innovative approaches to integrating new technologies with matriculation efforts. Riverside Community College, in association with Systems and Computer Technology, E-Squared Technologies and Pacific Bell, will incorporate the "smart card" with PCs, advanced "intelligent" telephones and the College's mainframe based student information system. By loading onto the smart card a student's academic history we can use the PC to access program and transfer data. The student, working with a counsellor, will be able to review progress toward specific graduation or transfer goals. The student may also obtain specific course by course and college by college articulation information enabling him/her to better meet education goals.

## THE PROJECT

Riverside Community College (RCC) has proposed an innovative approach to assist with matriculation in the California Community Colleges. The approach provides a simple and cost effective mechanism to support the following activities on a distributed and transferable basis:

* Provide students, counselors, tutors and others, a planning and analysis tool with which to provide information on progress towards a student's educational goal. This tool allows for comparisons of student coursework against degree and certificate requirements (degree audit) and articulation agreements with neighboring colleges and universities he or she may wish to attend.

* Provide a college or university, to which a student may aspire, the capability of easily accessing student, academic data which can be used for counseling and academic planning.

* Allow assessment, counseling and academic planning to be provided remotely, on multiple campuses or other locations with efficient access to the student's academic history and degree, certificate or transfer requirements.

The system being developed incorporates the use of smart cards, intelligent telephones, personal computers all in conjunction with the college's mainframe computer system. Smart cards are very small microcomputers packaged within credit card sized plastic cards. They provide a highly portable, efficient, and secure device upon which information can be carried. Such information as the student's academic history and educational plan can be stored electronically and transmitted between institutions and computers.

RCC, in conjunction with Systems & Computer Technology (SCT), E-Squared Technology (E-Square), Pacific Bell Telephone Company (Pac Bell) and the California Community College Chancellor's Office, will implement a demonstration project using this equipment in conjunction with a degree audit and articulation system, PC based, called "Project ASSIST." These smart student IDs will interact with assessment, counseling and planning applications being processed on independent personal computers. This approach makes the system extremely portable within a given college as well as exportable to other

institutions. Where multiple institutions have this approach in place, the data and tools required for appropriate academic planning for a student can be made available to all locations. The approach is practical, simple and cost effective. There is no need to invest great sums of money in complex data bases and real time networks. Nor is there need to maintain duplicate data bases between institutions. The official student's data will continue to be maintained by the college's central computing resource. The smart card will simply carry a copy of the appropriate data as of the most recent date and time the card interacted on-line with the central machine.

The experience of RCC with this project will be objectively evaluated and the results will be available for sharing with other colleges and districts. In this way the project will provide others information on a simple, innovative and cost effective approach to support matriculation.

## OPERATION

Students will be issued smart cards that are capable of storing and carrying a variety of information about the student. Students will use these smart cards to download from the mainframe, via smart telephones, appropriate academic data from the official records. To accomplish this, a student will insert his or her card into a smart telephone, select the appropriate menu option, enter his or her student identification and personal security code and have the system load current academic history data onto the card. The student may update his card (i.e. repeat the process) with a copy of his official record as often as he wishes or is deemed necessary and appropriate.

Once the card contains appropriate academic data, it will be used in conjunction with Project ASSIST running on a personal computer. This application provides for assessment of the student's record relative to his or her goals and evaluates those goals against stated degree and transfer requirements. For example, the student could obtain the following information and analysis:

* What courses have been completed that will transfer to neighboring institutions?
* What courses will be needed to complete graduation requirements for specific certificates or degrees?
* What other options are available?

The student can gain the above information for specific schools and majors as long as the institution has provided the

data in the form of articulation agreements. We anticipate that the systems developed from this project will enhance articulation efforts by allowing information to be transferred between cooperating schools in a much more concise manner and format.

This interactive process will be done at a personal computer with the smart card inserted in an associated reader/writer. The output would be to a hard copy printer which the student and counselor could review. It is also envisioned that the system will allow the student to capture on the card his or her proposed academic plan resulting from the session. This will allow additional counselling sessions to be held with much more current data.

Obviously, the system is usable by the student alone, or in consultation with tutors, counselors, assessment staff and others. The system, without the card, can be used as a planning and recruitment tool for high school seniors.

When the student takes the card, and its contained information, to a participating institution, a much more detailed discussion can take place regarding available programs based on actual completed coursework. Thus, this simple approach provides information for matriculation to be available and useful when and where it is needed.

## Presenter Information

Presentor 1: David J. Bell
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Biographical Information: David graduated from Central High School, Phildelphia, Pa., with a Bachelor of Arts degree and from Drexel University, Philadelphia, with a Bachelor of Science degree in Commerce and Engineering Sciences. Prior to joining RCC, David worked for Systems and Computer Technology, Deloitte, Haskins and Sells and International Business Machines (IBM).

Presentor 2: George Bjarke
Senior Consultant
Systems & Computer Technology Corporation
c/o Riverside Community College
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714 684-3240 extension 256

Biographical Information: George has been employed by Systems and Computer Technology Corporation (SCT) for the last nine years. He has held a variety of positions, all involved with the development of information systems at colleges and universities. Prior to joining SCT, he was the Director of Admissions at Pepperdine University. He holds both a Bachelors and Masters degree in Psychology, with an emphasis in school psychology and counseling.